FlexStar HDE-200

Installation Manual & User Guide

HARHDE200 FlexStar HDE-200 Embedded Exporter

HARHDE200-PROFAN Profanity Delay Upgrade
HARHDE200-PPM Arbitron PPM Interface Upgrade
HARHDE200-PROF/PPM Combined Upgrade

75-56
Revision F • 3/12

HARRIS

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CE Declaration of Conformity

Declaration of Conformity

Application of Council Directive: 2004/108/EC

Standards To Which Conformity Is Declared:

EN55103-1:1997 (Professional Audio)
EN55022 Class A
Radiated Emissions
Conducted Emissions
EN55103-1 Magnetic Emissions
EN61000-3-2 Harmonics
EN61000-3-3 Voltage Flicker

EN55103-2:1997 (Professional Audio)
EN55103-2 Magnetic Immunity
EN61000-4-2
EN61000-4-3
EN61000-4-4
EN61000-4-5
EN61000-4-6
EN61000-4-11

Manufacturer's Name: **Harris Corporation**

Manufacturer's Address: **1493 Poinsettia Avenue, Suite 143**
Vista, CA 92081
(760) 936 4010

Equipment Description: **Embedded Exporter**

Equipment Class: **Professional Audio Equipment Residential**

Model Numbers: **99 1440**

I the undersigned, hereby declare that the equipment specified above, conforms to the above Directive(s) and Standard(s).

Place:
Harris Corporation - Mason, Ohio USA
Signature:
Full Name:
Ted Staros
Position:
Director - Studio Products Development

Hazard/Warning Label Identification

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS PRODUCT TO RAIN, HIGH HUMIDITY OR MOISTURE.

WARNING: THIS PRODUCT USES A UL-LISTED 5 VDC POWER SUPPLY. IF REPLACEMENT IS REQUIRED, USE ONLY A HARRIS PRE50-26 POWER SUPPLY.

The **Exclamation Point symbol**, within an equilateral triangle, alerts the user to the presence of important operating and mainte-nance (servicing) instructions in product literature and instruction manuals.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Safety Instructions

1. **Read All Instructions.** Read all safety and operating instructions before operating the product.
2. **Retain All Instructions.** Retain all safety and operating instructions for future reference.
3. **Heed All Warnings.** You must adhere to all warnings on the product and those listed in the operating instructions.
4. **Follow All Instructions.** Follow all operating and product usage instructions.
5. **Heat.** This product must be situated away from any heat sources such as radiators, heat registers, stoves, or other products (including power amplifiers) that produce heat.
6. **Ventilation.** Slots and openings in the product are provided for ventilation. They ensure reliable operation of the product and keep it from overheating. Do not block or cover these openings during operation. Do not place this product into a rack unless proper ventilation is provided and the manufacturer's recommended installation procedures are followed.
7. **Water and Moisture.** Do not use this product near water such as a bathtub, wash bowl, kitchen sink, or laundry tub, in a wet basement, or near a swimming pool or the like.
8. **Attachments.** Do not use any attachments not recommended by the product manufacturer as they may cause hazards.
9. **Power Sources.** You must operate this product using the type of power source indicated on the marking label and in the installation instructions. If you are not sure of the type of power supplied to your facility, consult your local power company.
10. **Grounding and Polarization.** This product is equipped with a polarized AC plug with integral safety ground pin. Do not defeat the safety ground in any manner.
11. **Power Cord Protection.** Power supply cords must be routed so that they are not likely to be walked on nor pinched by items placed upon or against them. Pay particular attention to the cords at AC wall plugs and convenience receptacles, and at the point where the cord plugs into the product.
12. **Lightning.** For added protection for this product, unplug it from the AC wall outlet during a lightning storm or when it is left unattended and unused for long periods of time. This will prevent damage to the product due to lightning and power line surges.
13. **Overloading.** Do not overload AC wall outlets, extension cords, or integral convenience outlets as this can result in a fire or electric shock hazard.
14. **Object and Liquid Entry.** Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short out parts, which could result in a fire or electric shock. Never spill liquid of any kind on the product.
15. **Accessories.** Do not place this product on an unstable cart, stand, tripod, bracket, or table. The product may fall, causing serious injury to a child or adult and serious damage to the product. Any mounting of the product must follow manufacturer's installation instructions.
16. **Product and Cart Combination.** Move this product with care. Quick stops, excessive force, and uneven surfaces may cause the product and the cart combination to overturn.
17. **Servicing.** Refer all servicing to qualified servicing personnel.
18. **Damage Requiring Service.** Unplug this product from the wall AC outlet and refer servicing to qualified service personnel under the following conditions:
    a. When the AC cord or plug is damaged.
    b. If liquid has been spilled or objects have fallen into the product.
    c. If the product has been exposed to rain or water.
    d. If the product does not operate normally (following operating instructions).
    e. If the product has been dropped or damaged in any way.
    f. When the product exhibits a distinct change in performance. This indicates a need for service.
19. **Replacement Parts.** When replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer or that have the same characteristics as the original parts. Unauthorized substitutions may result in fire, electric shock, or other hazards.
20. **Safety Check.** Upon completion of any repairs to this product, ask the service technician to perform safety checks to determine that the product is in proper operating condition.
21. **Cleaning.** Do not use liquid or aerosol cleaners. Use only a damp cloth for cleaning.

Manual Revision History

Revision A - Preliminary release
Revision B - First official release, numerous technical and format changes
Revision B.1 - Supplemental software release information added, updated on-screen captures
Revision C - Section numbers added; updated user groups section; added manual rev history
Revision D - Updated specifications and SIS Summary illustration
Revision E - Updated specifications for Clock Outputs, IP addresses, added networking notes
Revision F - New Front Panel design changes, IP addressing changes, operational changes reflected for ECC app version 1.2.16 and HDE-200 firmware version 4.3.2.6

Trademark Information

FlexStar

FlexStar™ and HDE-200™ are proprietary trademarks of Harris Corporation.

HD Radio®

HD Radio™ Technology manufactured under license from iBiquity Digital Corporation. HD Radio™ and the HD Radio logo are proprietary trademarks of iBiquity Digital Corp.

Product Overview 1

Thanks for joining the broadcasters employing Harris Corporation products. Our mission: provide the highest quality products, systems, documentation, and after-sale support. We invite comments and suggestions for improvements to this documentation or to any of our services.

To obtain the maximum benefit from the FlexStar™ HDE-200's capabilities, read through this chapter, and the *Hardware* and the *Software* chapters, prior to product installation.

1.1 Product Overview

The HDE-200 is a Program Exporter for HD Radio™ broadcasts. It allows a broadcaster to add the necessary information to broadcast one or more HD Radio digital audio channels within their existing analog FM broadcast spectrum. The HDE-200 adds the signal encoding required by an HD Radio Exciter. In addition, it encodes Program Service Data (PSD), Advanced Application Services (AAS) data, and secondary channel audio supplied from an HD Radio Importer, like the Harris HDI-100 or HDI-200 Program Importer.

The HDE-200 outputs an Ethernet data stream, termed the E2X transport stream, to feed an HD Radio Exciter like the Harris HDX-100 Exciter.

The HDE-200 can be located in a studio or in a terminal room—as opposed to having to be co-located at the transmitter, as in earlier generations of Exporters. Its Ethernet output can be set to use UDP, TCP/IP, or Starlink MAC, making it fully compatible with Digital STLs, DHCP-controlled local area networks, and even the public Internet.

The HDE-200 is an *embedded exporter*, which means that the iBiquity™ HD Radio codec and data encoding algorithms, and the required diversity delay, are all processed within the unit. No external PC is required for daily operation, as in previous generations of Program Exporters.

This third-generation HD Radio Program Exporter provides a powerful hardware/software platform that offers improved reliability and ease-of-use—at a significantly lower cost, over first and second generation products. This is accomplished by "embedding" a microcontroller within the Exporter—eliminating the cost of an external Linux x86 PC and its custom hardware features.

Incorporating the control architecture within the HDE-200 allows the diversity delay to remain intact—even if a microcontroller reboot is required, something no previous design could do.

1.1.1 HDE-200 FEATURES

The HDE-200, once configured for your application, has just a few local controls (the front panel has seven control buttons plus indicator LEDs, two 10-Character displays, and a headphone jack for confidence monitoring). Setup and other monitoring and control functions are done by using the supplied HDE-200 Exporter Control Center software (ECC app).

The hardware controls on the front panel do allow the incoming or output audio to be monitored via a level meter and front panel headphone jack. Three buttons (**Delay Select**, **Ramp Up**, **Ramp**

Down) select which delay (Diversity Delay or the optional Profanity Delay) is being monitored and allow basic Ramp Up/Down control. The 10-Character displays show the status of the delay. The Ramp Up/Down LEDs indicate whether the delays are at zero, are ramping, or are complete.

More extensive control over the delays is done through the ECC app. A hardware studio remote panel can also be used to control such Profanity Delay features as Dump, Rebuild, and Ramp to Zero, and Diversity Delay control of Ballpark mode, which ramps the Diversity Delay out so that the analog broadcast of a live event (like a sporting event) can be done with minimal delay.

The front panel **Monitor Select** button allows any audio input or output to be monitored on the front panel level display, the front panel headphone jack, and the rear panel *Ref Mon Out* connection, which can feed a pair of digital monitor speakers.

A **Fault** LED on the front panel blinks if a GPS lock or audio fault occurs. Pressing the **Fault** button brings up a Fault display overriding the normal monitor level display.

There are two AES digital audio inputs on the HDE-200 (*Main Delay In* and *MPS Audio In*). The *Main Delay In*put is typically used for the audio going to the analog carrier, although it can also be the set as the source for the HD Radio main channel when both signals use common air chain processing. When the HD Radio main channel and analog broadcast use different signal processing, then the HD Radio main channel audio is connected to the Main Program Signal input (*MPS Audio In*).

Main Delay Out, which feeds the analog transmission chain, goes through an adjustable Diversity Delay to compensate for the HD Radio signal processing time. This is so an HD Radio receiver will smoothly blend between the analog carrier and digital main channel without any time-shifting artifacts. The ECC app is used to select which input signal feeds this output and to set the length of the Diversity Delay to keep the analog and digital broadcast audio outputs aligned in time.

A digital monitor output (*Ref Mon Out*) can feed a local digital audio monitor. Its source is set by the front panel **Monitor Select** button, between MPS in, MPS out, Main Delay In, and Main Delay out.

The 320 kbps E2X transport stream is output on the three Ethernet connections built into the HDE-200. These allow an HD Radio Exciter or Digital STL, plus an HD Radio Importer and an admin computer, to directly connect to the HDE-200 so a separate LAN switch is not required, although the HDE-200 can interconnect though any standard LAN switch, if required.

1.1.2 HDE-200 UPGRADES

Three upgrade kits are available: Profanity Delay (HARHDE200-PROFAN); Arbitron PPM Encoder Interface (HARHDE200-PPM); and a combined Profanity/PPM Encoder Interface (HARHDE200-PROF/PPM).

The Profanity Delay kits add a second delay function to the HDE-200—with remote studio logic control via a parallel logic I/O port or via on-screen commands, so that a separate profanity delay controller is not required. It has variable ramp times and allows delays of up to 35 seconds to be set using the HDE-200 ECC app.

The Arbitron PPM Encoder Interface allows two PPM Encoders to be used to separately add in the Personal People Meter encoding to the main HD Radio and analog carrier audio streams. These are both sent post Diversity Delay so that ramping in/out does not affect the PPM Encoding. The PPM Encoders connect to the HDE-200 using a standard XLR interface cable (supplied with the upgrade kit) that plugs into the Post Delay Loop I-O connector.

1.2 Specifications

Compliance

RoHS: Fully compliant
FCC: Meets FCC Part 15, under CE mark
UL: N/A. Commodity supply is UL approved

GPS Antenna Input

Connection: Type-F (+5 VDC on center pin)
Impedance: 50 ohms
GPS Antenna: Trimble Bullet III (supplied)

USB Interface

USB 2.0 Host (200 mA max current draw)

Ethernet Interface

3 Ethernet Ports: 10/100 T/TX IEEE802.3u compliant transceivers, auto negotiating
Default IP addressing:
Host : 10.10.10.10 *
Importer Receive: Port 10000
PSD Receive: Port 11000
Diversity Correction: Port 53491
DSP: 10.10.10.22 *
Multicast: 239.255.255.1 **
Community Announcements Port: 50010
Meter Data Port: 50020
Log Data Port: 8003
E2X Exgine Exciter Transmit: 10.10.10.11 *
E2X Data Port: 10000 (TCP/IP)
E2X Data Port: 11000 (UDP)

* These addresses may need to be changed, as needed, during product installation.
** This address is normally not changed.

Clocks (GPS referenced, with satellite lock)

10 MHz: +2 dBm, nominal @ 50 ohms (BNC) ±1 ppt, 24-hour avg
44.1 Word Clock: 2.5V nominal @ 75 ohms (BNC) ±1 ppt, 24-hour avg
1 PPS: 2.5 V nominal @ 50 ohms (BNC) ±100 nsec, relative to UTC

Digital Audio I/O

Internal Sample Rate: 44.1 kHz
AES Input Compliance: 16-bit or 24-bit (24-bit inputs are truncated to 16-bits)
Input Signal Format (Main Delay In, MPS Audio In): 110 ohm AES (S/PDIF accepted, 0.3 Vpp min)
Input Sample Rate (Main Delay In, MPS Audio In): 32 kHz to 96 kHz
Output Signal Format (Ref Mon Out and Main Delay Out): 110 ohm AES
Output Sample Rate (Ref Mon Out and Main Delay Out): 44.1 kHz
AES Output Compliance (Ref Mon Out and Main Delay Out): 16-bit
Encoded HD output: As specified by iBiquity IRSS (iBiquity Reference System Software) ver 4.x.

Audio Frequency Response

Main Delay Input to Main Delay Output: ±0.01 dB, 20 Hz to 20 kHz

Audio Dynamic Range

Main Delay Input to Main Delay Output: 96 dB (16-bit limited)

Audio Total Harmonic Distortion + Noise

Main Delay Input to Main Delay Output: <0.005%, 20 Hz to 20 kHz, -6 dbFS input, -6 dbFS output, 22 kHz filter bandwidth

Remote I/O Logic

Logic Inputs: Opto-isolated
Logic Outputs: Opto-isolated
+5 VDC/GND: Used with control panels and other fully isolated devices only

Environment

Ambient Temperature: 0°C - 50°C
Cooling: Convection cooled, no fans

Power Requirements

<30 watts at 120 VAC / 60 Hz

Power Supply

Supply: Commodity type, plug in, single output (+5 VDC)
AC input: Polarized power cord, for 3-pin North American outlets (IEC60320-C13 to 5-15P)

Dimensions

1RU: 1.75" x 19" x 12" (H, W, D)

Weight

4 lbs

Harris Corporation reserves the right to change specifications without notice or obligation.

1.3 Warranty

Equipment Warranty Claims and Procedures

1. The Standard Equipment Warranty Period is 15 months from date of equipment shipment from a Harris facility. The Customer's sole and exclusive remedy for any breach of the Standard Equipment Warranty will be, at Harris' sole discretion and option, repair or replacement of the defective Product. Components that Customer claims to be defective must be made available to Harris for inspection and evaluation. Unless otherwise agreed in writing by Harris, Customs clearance for all replacement parts under the warranty or otherwise will be Customer's sole responsibility. To be entitled to rights under the Standard Equipment Warranty, the Customer must notify Harris in writing within thirty (30) days after discovering a suspected defect in any Product or Services, but in any event prior to the expiration of the applicable Standard Warranty Period. *Notice to a Harris dealer, system integrator, sales representative or other third party is not notice to Harris.* Following its receipt of any such Customer notice, Harris will determine whether the reported problem is covered by this Standard Equipment Warranty. If Harris determines that the problem is covered, Harris will authorize repair or replacement of the defective Product, as deemed appropriate by Harris in its sole discretion. For clarification purposes, any technical support provided by Harris will be for the sole purpose of fulfilling Harris' warranty obligations. If Harris determines that Customer is using technical support as a substitute for training of Customer's personnel, then such technical support will be subject to additional charges at Harris' prevailing unit rate for such services.

2. Before shipping any Product to Harris, the Customer must obtain a written Return Authorization from Harris, and provide any proof of warranty eligibility requested by Harris. Any Product received by Harris without a Return Authorization may, at Harris' option, be returned to the Customer collect. Once a Return Authorization is obtained, the Customer is responsible for packing and shipping the Product, to which its warranty claim relates, to a service facility designated by Harris, with all shipping charges prepaid by the Customer, within thirty (30) days after receipt of the Return Authorization. Harris will pay for return of the repaired or replacement Product to the Customer if the repaired or replacement Product is shipped to a designated Harris service facility. Harris will use commercially reasonable efforts to supply Equipment (or part thereof) from the geographical region of Customer's site, so as to minimize freight and duty. Harris bears the risk of loss or damage while the Equipment (or part thereof) is in transit to Customer from the Harris Service Center, and Customer bears the risk of loss or damage while the Equipment (or part thereof) is in transit back to the Harris Service Center.

3. Upon receipt of replacement Equipment (or a part thereof), Customer has thirty (30) days to tender the defective Equipment (or part thereof) to the return carrier for shipment to the service center designated by Harris. If Customer does not timely return the defective Equipment (or a part thereof), Harris shall invoice Customer for the list price of such Equipment (or part thereof), plus applicable shipping. Such failure to return the Equipment (or part thereof) may, in Harris' discretion, be grounds for termination of the Warranty and/or suspension of any future advance exchange privileges until such outstanding defective Equipment has been returned. Under the Standard Equipment Warranty Harris will provide Customer with new, rebuilt, refurbished or alternate Equipment (or a part thereof) of equal or improved quality, as the exchange Equipment (or part thereof) to replace eligible defective Equipment (or part thereof). Any alternate Equipment (or part thereof) will meet or exceed the specifications of the replaced Equipment (or part thereof). Rebuilt or refurbished Equipment may bear cosmetic blemishes that do not affect performance. Unless otherwise specified by Harris in writing, repaired or replaced Equipment (or parts thereof) are covered only for the remainder of the term of the applicable Standard Equipment Warranty. All defective Equipment (or parts thereof) replaced by Harris become the property of Harris. Harris has no obligation to (i) service, exchange or otherwise replace any Equipment (or part thereof) that has been damaged, modified, abused, misused or overused as determined by Harris or has been used with non-Harris supplies or products that have caused damage or malfunction; (ii) paint, refinish, refurbish, restore or exchange any Equipment (or part thereof) with cosmetic blemishes; (iii) service, exchange or otherwise replace any Equipment (or part thereof) if the same would interfere with, impede or be redundant with normal or scheduled maintenance of such Equipment (or part thereof); (iv) service, exchange or otherwise replace any Equipment (or part thereof) that is within sixty (60) days of the end of its production life; or (v) provide any application software support or service involving application hardware or replace any accessories. If Harris elects to perform any such services at Customer's request, then such services will be deemed a service call and all labor, parts and materials used for the service call will be charged at Harris' then-prevailing rates.

Equipment Warranty Exclusions

Harris does not warrant nor guarantee, and is not responsible for:

1. Defects, failures, damages or performance limitations caused in whole or in part by (A) power failures, surges, fires, floods, snow, ice, lightning, excessive heat or cold, highly corrosive environments, accidents, actions of third parties, or other events outside of Harris' control, or (B)

Customer's abuse, mishandling, misuse, negligence, improper storage, servicing or operation, or unauthorized attempts to repair or alter the Equipment in any way. Customer must provide qualified technical personnel to maintain and repair the Equipment.

2. Equipment built to Customer's specifications that are later found not to meet Customer's needs or expectations.

3. The performance of the Equipment when used in combination with equipment not purchased, specified, or approved by Harris.

4. Signal coverage delivered by antenna equipment whether or not supplied by Harris.

5. Batteries and other consumable goods.

Additional Warranty Notes

1. OEM or Third Party equipment that is incorporated into Harris Equipment is covered under the applicable Harris Standard Equipment Warranty unless the OEM or Third Party equipment carries its own limited warranty, in which event the OEM or Third Party warranty will apply to such equipment incorporated into Harris Equipment. For example and not limitation, CRTs, LCDs, FSMs and Optical Test products are OEM products that have a limited 1 year manufacturer's warranty.

2. Items Sold As Resale. Items sold as resale are such items that are not manufactured by Harris but may be utilized in conjunction with or independently of Harris manufactured Equipment (such as tubes, printers and antenna transmission lines) and shall be covered only by the specific warranty terms of the supplier or original equipment manufacturer of those items. IF AN ORDER COVERS EQUIPMENT NOT OWNED BY HARRIS, IT IS SOLD SUBJECT TO HARRIS' ACQUISITION OF POSSESSION.

3. B-Stock Equipment. B-Stock Equipment for non-transmitter related Equipment is defined as any non-out-of-production product that is less than three (3) years old. B-Stock Equipment related to transmitters is defined as equipment repurchased by Harris that is reconditioned or refurbished for sale to a second generation owner by Harris or its reseller.

4. Used Equipment. IF THE EQUIPMENT SPECIFIED IN AN ORDER IS DESCRIBED AS USED, UNLESS OTHERWISE AGREED IN WRITING BY THE PARTIES, IT IS SOLD "AS IS" AND WITH NO WARRANTY.

Services Warranty

Harris warrants that the Services will be performed in a professional manner (the "Services Warranty"). Notice of a breach of the Services Warranty must (i) specify in reasonable detail, the nature of the claim, and (ii) be received within ninety (90) days from the last day of performance of the Services. Upon notice of a breach of the Services Warranty and Harris' determination of the validity of such breach of the Services Warranty, Harris will re-perform the applicable Services at Harris' expense. If after reasonable opportunity Harris is unable to re-perform such Services to the reasonable satisfaction of Customer, Customer may, as its exclusive remedy, obtain a refund of the fees paid to Harris under the applicable Order for such Services.

Software Warranty

1. Physical Media. Harris warrants all physical media ("software media") for the Licensed Programs, including without limit custom software and traffic translators, to be free of defects in material or workmanship for a period of ninety (90) days from the date of completed installation, or if Customer should assume responsibility for installation of the Software, for a period of ninety (90) days from the date of shipment of the Licensed Programs by Harris (the "Software Warranty Period"). This limited warranty extends only to Customer as the original licensee. Customer's sole and exclusive remedy under this limited warranty will be, at Harris' option, repair or replacement of the software media.

2. Licensed Programs. Harris warrants that during the Software Warranty Period (or such other time period as agreed in writing by the parties) the Licensed Programs shall operate substantially in compliance with Harris' specifications for the Licensed Programs (the "Software Warranty"). The entire liability of Harris under this limited warranty is to provide, free of charge, a corrected copy of any portion of the Licensed Programs which is found by Harris inspection not to be in substantial compliance with its specifications. If Harris is unable to provide a corrected copy of the Licensed Programs within a reasonable time, as Customer's sole and exclusive remedy, Harris will replace the same with a functionally similar program or refund to Customer the amounts Customer paid Harris to purchase or license such Licensed Programs. Harris does not warrant that such Programs are error free or that Customer will be able to operate such Programs without problems or interruptions. Corrections to the Licensed Programs beyond the Software Warranty Period will only be made by Harris pursuant to a separate software maintenance agreement.

3. Cost of Corrections. During the Software Warranty Period, Harris will bear the material cost and shipment of corrected or replacement Software at no charge to Customer. Software corrections will be sent via e-mail. In the rare event Customer requires a Harris customer support engineer to visit the site, related reasonable pre-approved on-site time and travel expenses will be billed at the prevailing daily rates, unless otherwise agreed to in writing prior to the visit. A ONE-DAY MINIMUM CHARGE APPLIES TO ALL ON-SITE VISITS.

4. Software Warranty Exclusions. The Software Warranty does not apply to any software media

or Licensed Program that (A) has been altered or modified, except by Harris; (B) has not been installed, operated, repaired, or maintained in accordance with instructions supplied by Harris; (C) has been subjected to abnormal physical or electrical stress, misuse, negligence, or accident; or (D) is used in ultrahazardous activities.

Disclaimer of Warranties

EXCEPT AS EXPRESSLY PROVIDED IN THIS STANDARD WARRANTY POLICY STATEMENT, HARRIS HEREBY EXPRESSLY DISCLAIMS ALL REPRESENTATIONS, CONDITIONS AND WARRANTIES, WHETHER EXPRESS OR IMPLIED, INCLUDING BY WAY OF EXAMPLE AND NOT LIMITATION, THE IMPLIED WARRANTIES OF TITLE, MERCHANTABILITY, NON-INFRINGEMENT AND FITNESS FOR A PARTICULAR PURPOSE.

Limitation on Liability

NOTWITHSTANDING ANYTHING HEREIN TO THE CONTRARY, IN NO EVENT WILL HARRIS BE LIABLE FOR ANY SPECIAL, INCIDENTAL, PUNITIVE OR CONSEQUENTIAL DAMAGES WHATSOEVER, INCLUDING LOSS OF PROFITS, WHETHER ARISING IN CONTRACT, TORT, WARRANTY OR OTHERWISE, EVEN IF IT HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THE LIMITATIONS SET FORTH HERE WILL APPLY EVEN IF THE REMEDIES OF ERROR CORRECTION, REPAIR OR REPLACEMENT, REPERFORMANCE OF SERVICES AND REFUND OF PAYMENTS COMPLETELY FAIL OF THEIR ESSENTIAL PURPOSE. NOTWITHSTANDING ANYTHING HEREIN TO THE CONTRARY, THE LIMIT OF HARRIS' LIABILITY (WHETHER IN CONTRACT, TORT, NEGLIGENCE, STRICT LIABILITY, BY STATUTE OR OTHERWISE) TO CUSTOMER OR TO ANY THIRD PARTY CONCERNING THE HARRIS EQUIPMENT OR SOFTWARE LICENSES SOLD TO CUSTOMER AND WARRANTED HEREUNDER, HARRIS' PERFORMANCE OR NONPERFORMANCE, OR IN ANY MANNER RELATED TO THIS STANDARD WARRANTY POLICY STATEMENT, FOR ANY AND ALL CLAIMS WILL NOT IN THE AGGREGATE EXCEED THE ACTUAL AMOUNTS RECEIVED BY HARRIS FOR THE SPECIFIC PRODUCT WITH RESPECT TO WHICH SUCH CLAIM IS MADE.

Governing Law and Jurisdiction

Applicable Law, Venue and Jurisdiction. This Standard Warranty Policy Statement, and any disputes related hereto, shall be governed by and interpreted in accordance with the laws of the State of Florida, USA, regardless of any law principles requiring the application of any other law. The parties agree that the exclusive venue for any action related to the dispute or interpretation of this Agreement shall be in the courts with the appropriate jurisdiction located in Orlando, Florida, and each party irrevocably submits to the jurisdiction of each such court in any such action and waives any objection it may now or hereafter have to venue or personal jurisdiction in each such court. The prevailing party in any action related to the dispute or interpretation of this Agreement shall be entitled to recover its reasonable attorneys fees incurred in pursuing the action, including those fees incurred throughout all bankruptcy and appellate proceedings.

Jury Waiver. THE PARTIES FURTHER AGREE, TO THE EXTENT PERMITTED BY LAW, TO WAIVE ALL RIGHTS TO A TRIAL BY JURY OF ANY ACTION RELATING TO THE DISPUTE OR INTERPRETATION OF THIS AGREEMENT, WHETHER SOUNDING IN CONTRACT, TORT, OR OTHERWISE. THE PARTIES SPECIFICALLY ACKNOWLEDGE THAT THIS WAIVER IS MADE KNOWINGLY AND VOLUNTARILY AFTER AN ADEQUATE OPPORTUNITY TO NEGOTIATE ITS TERMS.

Hardware

2

The HDE-200 can be mounted in a studio, terminal room, or transmitter facility. It requires one rack unit (1RU) of space. No special venting requirements are required and low power equipment can be mounted directly above and below the unit.

2.1 Installation Overview

All HDE-200 signal and power connections are made on the rear panel. There are no internal adjustments on the HDE-200, but there are optional upgrade kits that require removing the top cover for installation. We recommend installing any upgrade kit (Profanity Delay and/or Arbitron PPM Encoder Interface) before the HDE-200 is rack mounted. Upgrade kit installation instructions are presented on page 2-3.

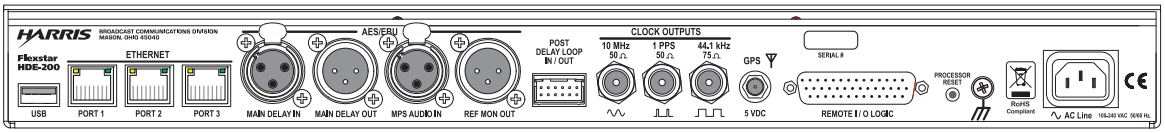
2.1.1 AUDIO CONNECTIONS

There are four AES-3 balanced digital audio connections using XLR-type connectors. All conform to standard AES-3 (AES/EBU) digital wiring practices (3 volt signals, 110 ohm, balanced lines) and levels (-20 dBFS corresponds to 0 VU on the on-screen metering). For best results use 110 ohm balanced wiring suitable for digital audio signals on these four connections.

Note that unbalanced 75 ohm S/PDIF digital audio signals can be connected to the AES inputs. See page 2-6 for connection details.

The HDE-200 has two audio inputs: the Main Program Service input (*MPS Audio In*), which is the audio for the HD Radio main channel; and the *Main Delay In*, which is the audio input for the analog broadcast carrier. If the HD Radio main channel and analog carrier will use the same signal, then connect to the *Main Delay In* connector. Which inputs are active is set using the Exporter Control Center program (ECC app).

HDE-200 Front Panel



HDE-200 Rear Panel

The HDE-200 draws about 30 watts from a 100-240 VAC, 50/60 Hz outlet. An IEC power cord, terminating in a Type B plug (for the USA, Canada and Japan) is included with the HDE-200.

The HDE-200 is designed to be rack mounted using four rack screws.

The *Main Delay Output* feeds the analog transmission chain. It is time delayed, by the Diversity Delay setting, so that HD Radio tuners will seamlessly switch between the analog carrier and the HD Radio main channel. The Diversity Delay will be roughly eight seconds when compared to

an undelayed analog broadcast signal. The Diversity Delay is set using the ECC app.

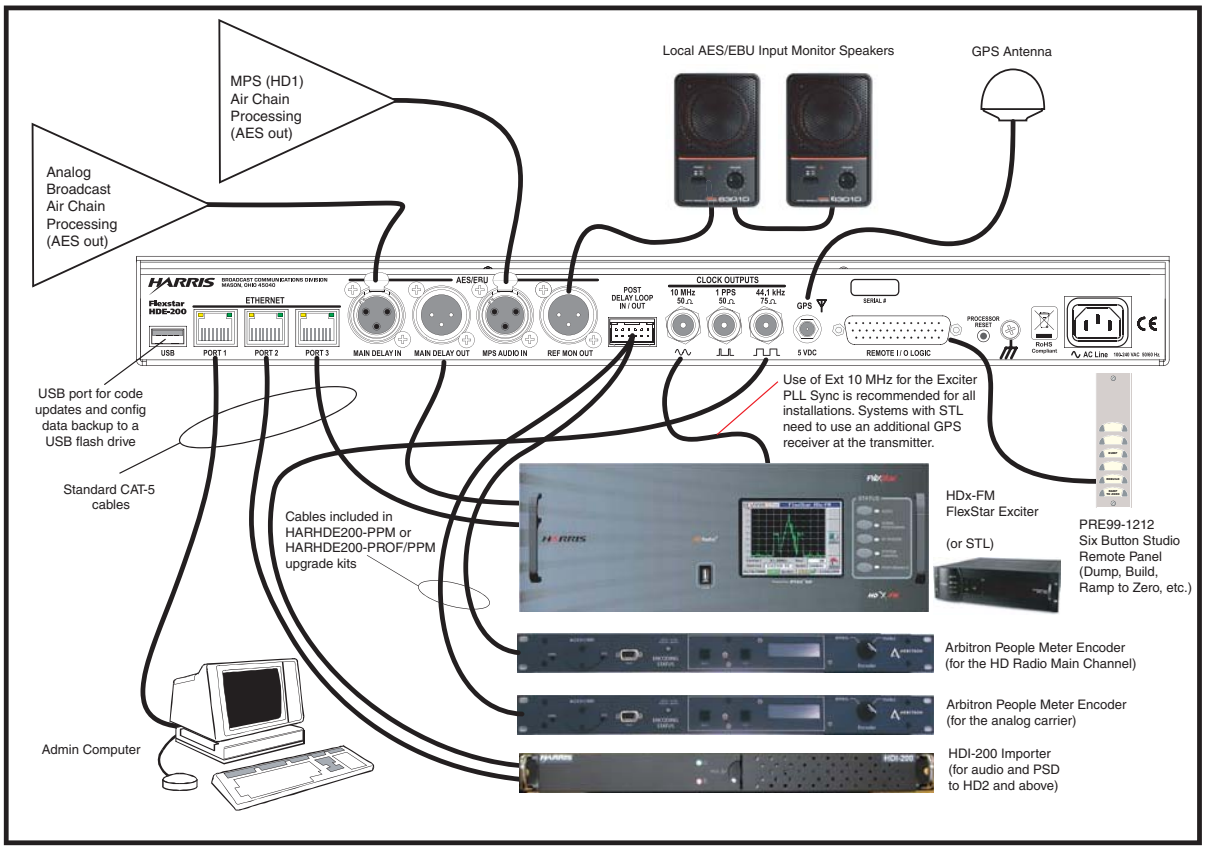
The fourth digital audio connection is a Reference Monitor output (*Ref Mon Out*) that can feed a pair of local digital monitor speakers. Its source (*MPS Audio In*, MPS Output, *Main Delay In*, or *Main Delay Out*) is set by the front panel **Monitor Select** button. The front panel headphone jack is fed with the same monitor audio, but it's level controlled using the front panel **HP Volume** down and up (▽△) buttons.

2.1.2 CONNECTION SUMMARY

A summary of the HDE-200's audio, networking, and logic connections is shown below. In addition to the four AES audio connectors there are: a loop-thru connector for interfacing two Arbitron PPM Encoders; three RJ45 Ethernet ports; a USB 2.0 host port; a Remote Logic I-O connector; a GPS antenna input; and clock outputs used when an HD Radio Importer and HD Radio Exciter are co-located with the HDE-200.

There is no dedicated output connector for the HD Radio main channel signal since it consists of a 320 kbps data stream (for FM broadcast) which is routed to the HD Radio Exciter, either directly or through a digital STL, using UDP or TCP/IP, though one of the Ethernet ports on the HDE-200. Three ports are supplied so an HD Radio Importer, an HD Radio Exciter (or digital STL), and an admin computer can directly connect to the HDE-200.

The HDE-200 can, alternately, connect through a standard LAN switch in order to feed the data stream to the STL or HD Radio Exciter.



HDE-200 Connection Summary

NOTE: The HDE-200 uses two IP addresses, one for the CPU (default: 10.10.10.10), the other for the iBiquity HD Radio DSP board (default: 10.10.10.22). Do not connect any CAT-5 cables to the HDE-200's three Ethernet ports until after the IP addresses and other network settings are configured. This can be done is two ways: by following the procedure in the Software chapter (page 3-6), or by running the ECC app on a host computer with its IP address set to the 10.10.10.x subnet in order to connect to the Exporter.

If the subnet of the Exporter is changed from the default, then the Host Subnet must also be changed. For most installations it will probably be easier to use the HDE-200 configuration method presented in the Software chapter.

2.2 Optional Upgrade Kits

Three upgrade kits are available to expand the HDE-200 functionality: a Profanity Delay Upgrade (HARHDE200-PROFAN) adds the profanity delay option so that a separate profanity delay and controller are not required; an Arbitron PPM Encoder Interface (HARHDE200-PPM) activates the rear panel Loop Thru connection to interface two Arbitron PPM Encoders (one for the analog channel, the other for the HD Radio main channel); and a combined upgrade (HARHDE200-PROF/PPM) which adds the Profanity Delay and activates the Arbitron PPM Encoder interface.

The Profanity Delay adds a second delay function to the HDE-200—with remote studio logic control via the Remote I-O Logic connector or via on-screen commands, so that a separate profanity delay controller is not required. It has variable ramp times and allows profanity delays of up to 35 seconds to be set through the ECC app. This delay is completely separate from—and does not affect, the Diversity Delay built into the HDE-200.

The Arbitron PPM Encoder Interface connects two PPM Encoders to add the People Meter signals to the main HD and analog carrier audio streams. These are post processing and Diversity Delay so that ramping the Diversity Delay in or out does not affect the PPM Encoding.

The PPM Encoders connect to the HDE-200 using XLR interface cables, included in the upgrade kit, which plug into the *Post Delay Loop In/Out* connector. The six foot long cables plug into the PPM Encoder's *In* and *Out* connectors.

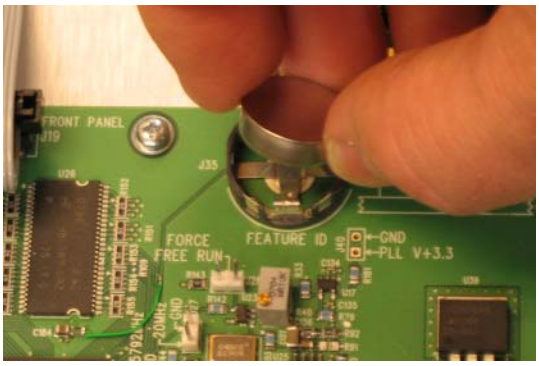
2.2.1 UPGRADE KIT INSTALLATION

Installing an upgrade kit requires that the HDE-200 top panel be removed to install an *iButton* which activates the purchased option.

iButton

Power down the HDE-200, then remove 11 flathead Phillips screws along the edges of the cover, and lift the cover off.

Dissipate any static charges before removing the *iButton* from its antistatic packaging. Do not touch any components inside the HDE-200, except for the *iButton* socket, which is on the main interface board next to the ribbon cable going to the front

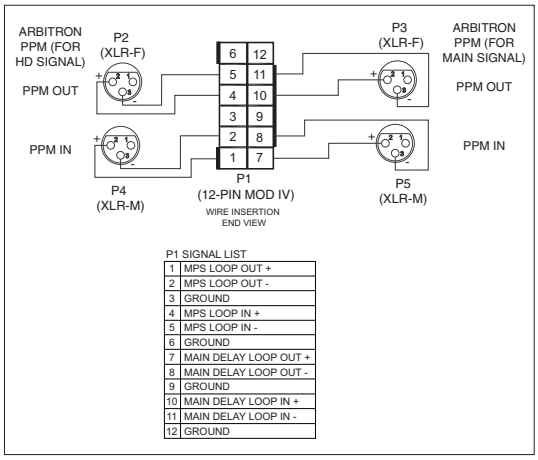


Snapping the iButton into its Main Board Socket

panel display board, as shown on the previous page. Replace the top cover, then rack mount the HDE-200 using four rack screws.

The PPM Encoder kits include an interface cable (schematic shown below) which plugs into the keyed *Post Delay Loop In/Out* connector on the rear panel. Connectors P2 and P4 go to the PPM Encoder for the HD Radio main channel. Connectors P3 and P5 go to the PPM Encoder for the analog broadcast channel.

NOTE: Use only these AES Digital PPM Encoders (Arbitron 1000-1134-xx, 1000-1149-xx, 1000-1150-xx or 1000-1161-xx) with the HDE-200.



P1 SIGNAL LIST

1	MPS LOOP OUT +
2	MPS LOOP OUT -
3	GROUND
4	MPS LOOP IN +
5	MPS LOOP IN -
6	GROUND
7	MAIN DELAY LOOP OUT +
8	MAIN DELAY LOOP OUT -
9	GROUND
10	MAIN DELAY LOOP IN +
11	MAIN DELAY LOOP IN -
12	GROUND

People Meter Encoder Interface Cable

2.3 HDE-200 Connections

How the HDE-200 is physically connected with peripheral devices depends upon where the HDE-200 is installed (a studio, the TOC, or transmitter room) and what peripherals are connected, so all connections may not be used.

2.3.1 GROUNDING & SHIELDING

With the HDE-200 rack mounted, the broadcast facility's technical ground wire can connect to the chassis ground screw provided on the rear panel near the power supply.

For signal shielding, connect the digital audio cable shields at both the HDE-200 and the interconnecting equipment ends when all system components share a common ground potential and use isolated ground AC outlets tied to the main technical ground.

When isolated ground AC outlets are not available, connect cable shields at the HDE-200 end only. Do not connect the shields at the peripheral equipment end. Ensure that all peripheral equipment has a clean ground, either through their power cords or through separate ground wires tied to the facility's technical ground.

GROUNDING NOTE: The power supply's AC mains safety or "U" ground ties to the chassis. A rear panel screw can be used for a separate ground wire to technical ground.

AUDIO GROUND NOISES: Buzz pickup is generally electrostatic—capacitive coupling between audio lines and AC power lines or logic and display cabling. To avoid audio ground noises, separate audio wires, as much as possible, from AC power lines and logic/display cabling.

2.3.2 GPS ANTENNA CONNECTION

The HDE-200 uses the GPS System to ensure the time-accuracy of its internal 44.1 kHz sample clock and HD Radio data stream. The included (or equivalent) GPS antenna must be connected and must have sufficient sky exposure to lock onto the GPS satellites in order to meet operational specifications. In addition, the HD Radio Exciter must also be locked to the GPS System.

When the HDE-200 is co-located with the HD Radio Exciter its 10 MHz clock output can be used to sync the two products together. When the

HD Radio Exciter is remotely located, a 10 MHz GPS reference at the Exciter is *strongly recommended*.

Under some conditions a GPS reference at the Exciter may not be essential. Exporter Reference mode is used for this implementation. Ethernet performance can have great variability, consequently this method may not be sufficiently reliable. The packet jitter performance, or performance of your particular Ethernet connection to the Exciter, will determine the reliability of Exporter Reference operations. Please consult your Exciter's documentation for more information.

A Trimble Bullet III GPS antenna, with type-F connector, is supplied with the HDE-200. Up to 75 feet of customer-supplied RG-58 (50 ohm coax) or RG-59 (75-ohm coax) cable can connect it to the *GPS Antenna* input. The GPS input uses a type-F connector for easy installation.

An existing GPS antenna, like the Panasonic VIC-100 supplied with other Harris products, can alternately be used. An existing VIC-100 cable would have to use a TNC-to-F adapter or a type-F connector would have to be crimped onto the cable in order to connect it to the HDE-200.

Other GPS antennas may work with the HDE-200, but they must use +5 VDC for power (many GPS antennas use +3.3 VDC). Their gain specifications must at least equal the Bullet III antenna.

When a GPS antenna is powered by another device, an in-line DC-block or a DC-blocking power divider should be used to connect the antenna cable to the HDE-200's GPS input. Note that the +5 volt supply for the GPS antenna is only current protected against momentary shorts.

NOTE: If the HDE-200 is not locked onto the GPS satellites a **GPS Unlock**, an ECC app alarm, and a remote logic status tally (*Critical Fault*) are activated until GPS lock is obtained.

2.3.3 AUDIO CONNECTIONS

All audio wiring to/from the HDE-200 is AES/EBU digital (AES-3). Each audio connector (3-pin, XLR-type) uses this pinout:

AES/EBU Digital Inputs & Outputs

Pin	*Signal Description*
1	Shield (connects directly to the chassis)
2	High (+), typically a red or blue wire
3	Low (-), typically a black or white wire

The digital inputs (*Main Delay In* and *MPS Audio In*) accept AES-3 compatible signals using sample rates from 32 to 96 kHz. Each 110 ohm input is transformer coupled, which feeds a sample rate converter that converts the signal to the HDE-200's internal sample rate of 44.1 kHz.

For most applications, connect the processed audio source for the analog broadcast to the *Main Delay In* connector. Connect the processed audio source for the HD Radio main channel to the *MPS Audio In* connector.

If there is only one processed audio signal to feed both the analog and digital Exciters, connect that signal to *Main Delay In*. You must then use the ECC app to change the HDE-200 to use only the *Main Delay In* connector (otherwise there will be an *Audio Fault* indication). The input option is set in the **System > Other Controls** pop-up window by clicking the *Main Only* option.

The two digital outputs (*Main Delay Out* and *Ref Mon Out*) are transformer-coupled AES-3 compatible signals using a 44.1 kHz sample rate.

Main Delay Out is the analog broadcast signal with Diversity Delay (and PPM Encoder signals when the optional PPM interface kit is installed). This signal connects directly to the analog broadcast Exciter or to a digital STL to feed the analog transmission chain.

Ref Mon Out can connect to a local rackmount digital monitor speaker, like the Fostex RM-2 or to a pair of powered digital input speakers like

the Fostex 6301D. It can alternately be used as a source for a balanced AES-3, 44.1 kHz master sample clock signal.

Pins 2 and 3 of each digital input and output are fully protected against static (ESD), overvoltage spikes (EFT), and lightning surges. Pin 1 and the XLR shell are tied directly to chassis ground.

If the HDE-200 power is lost, the *Main Delay In* signal is relay switched to directly connect to the *Main Delay Out* connector for uninterrupted operation.

When power is applied, it takes about one minute for the HDE-200 to begin transmitting the HD Radio data stream again. The *Main Delay Out* signal will automatically start to rebuild its Diversity Delay about 30 seconds after power is applied. The method used to rebuild the Diversity Delay is set using the ECC app's **System > Other Controls** pop-up window.

2.3.4 HDE-200 SAMPLE & BIT RATE

The HDE-200 uses a 44.1 kHz sample rate for internal signal processing. The sample clock is synchronized with a time-based signal obtained from an internal GPS receiver. This ensures sample-accurate synchronization with the HD Radio Exciter.

The *44.1 kHz* clock output (75 ohm BNC) is typically tied to the HD Radio Importer in order to synchronize it with the HDE-200 Exporter.

The *Ref Mon Out* output (a female XLR connector) can also be used as a 44.1 kHz master sample clock output source.

All digital inputs (*Main Delay In*, *MPS Audio In* and the two *Post Delay Loop* inputs) use built-in sample rate conversion. Signals with sample rates between 32 and 96 kHz and with bit depths of 16- or 24-bits can be received. Bit depth is truncated to 16-bits internally in the HDE-200.

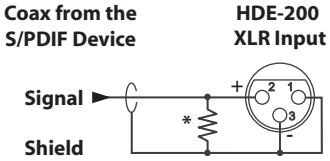
Note that sample rate and bit depth conversion cannot be bypassed in the HDE-200.

All digital outputs (*Main Delay Out*, *Ref Mon Out*, the HD Radio data stream and the two *Post Delay Loop* outputs) use a 44.1 kHz sample rate that is time-synchronized using the GPS System clock signals. The HDE-200 outputs a 24-bit word, which is using the 16 most significant bits.

2.3.5 S/PDIF CONNECTIONS

Digital devices with S/PDIF unbalanced outputs can connect to an HDE-200 input by tying pins 1 and 3 together to unbalanced the input.

When a longer cable (beyond about fifteen feet) is used, a 249 ohm terminating resistor may be required to impedance match the S/PDIF cable (which is typically 75-ohm coax cable) to the 110 ohm input. For shorter cables (under about fifteen feet), the terminating resistor is typically not required. Solder the resistor onto the male XLR terminals, per the following illustration.



*** 249 ohm termination resistor required if signal drops outs are encountered (typically only used with long cable runs)**

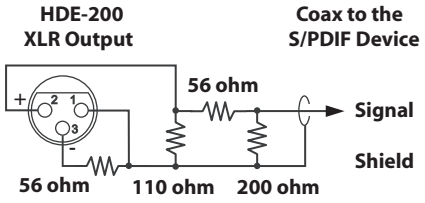
Connecting an S/PDIF Device to an HDE-200 AES/EBU Input

An unbalanced-to-balanced line transformer can alternately be used to interface a S/PDIF signal to an AES-3 input.

To connect an HDE-200 output to an S/PDIF input requires a voltage divider be used to lower the AES-3 signal level to a level the S/PDIF input can handle (shown in the diagram on the next page).

Note: Some S/PDIF devices may not interface correctly with the HDE-200—even after adding resistors or

using transformers, because of inherent protocol differences between the AES-3 and S/PDIF formats. Rane Corp. has a well-written application note (www.rane.com/note149.html) which addresses AES/EBU and S/PDIF signal interfacing.



Connecting an HDE-200 AES/EBU Output to an S/PDIF Device

2.3.6 USING A STUDIO REMOTE PANEL

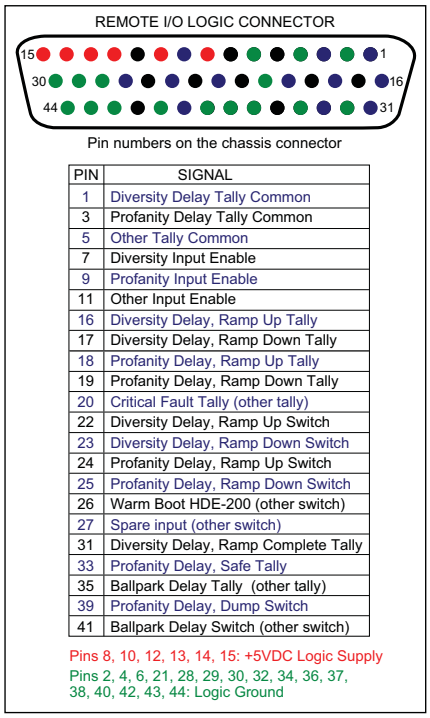
A 44-pin D-Sub connector (*Remote I-O Logic*) allows remote control and delay status indication for the HDE-200. It's typically wired to a studio-mounted remote panel like the six-button Harris Control Panel (Harris p/n PRE99-1212).

The *Remote I-O Logic* interface block diagram, shown on page 2-8, is divided into three main sections: Diversity Delay; Profanity Delay; and Other controls and tallies/status indicators. Each section's inputs and outputs are separately enabled by jumpering pins on the panel to +5VDC or Logic Ground, for most applications.

All logic connections (see the signal summary on this page) are opto-isolated through using opto-couplers on the inputs and solid-state "dry-contact relays" on the outputs.

To maintain complete isolation, do not use the +5 VDC Logic Supply or the Logic Ground pins when connecting the *Remote I-O Logic* connector to active peripheral devices. Power and ground should be sourced from the peripheral device.

The +5 VDC Logic Supply and Logic Ground connections are intended for use with a studio remote control panel only.



PIN	SIGNAL
1	Diversity Delay Tally Common
3	Profanity Delay Tally Common
5	Other Tally Common
7	Diversity Input Enable
9	Profanity Input Enable
11	Other Input Enable
16	Diversity Delay, Ramp Up Tally
17	Diversity Delay, Ramp Down Tally
18	Profanity Delay, Ramp Up Tally
19	Profanity Delay, Ramp Down Tally
20	Critical Fault Tally (other tally)
22	Diversity Delay, Ramp Up Switch
23	Diversity Delay, Ramp Down Switch
24	Profanity Delay, Ramp Up Switch
25	Profanity Delay, Ramp Down Switch
26	Warm Boot HDE-200 (other switch)
27	Spare input (other switch)
31	Diversity Delay, Ramp Complete Tally
33	Profanity Delay, Safe Tally
35	Ballpark Delay Tally (other tally)
39	Profanity Delay, Dump Switch
41	Ballpark Delay Switch (other switch)

Pins 8, 10, 12, 13, 14, 15: +5VDC Logic Supply
Pins 2, 4, 6, 21, 28, 29, 30, 32, 34, 36, 37, 38, 40, 42, 43, 44: Logic Ground

Remote I-O Logic Signal Summary

Logic Inputs

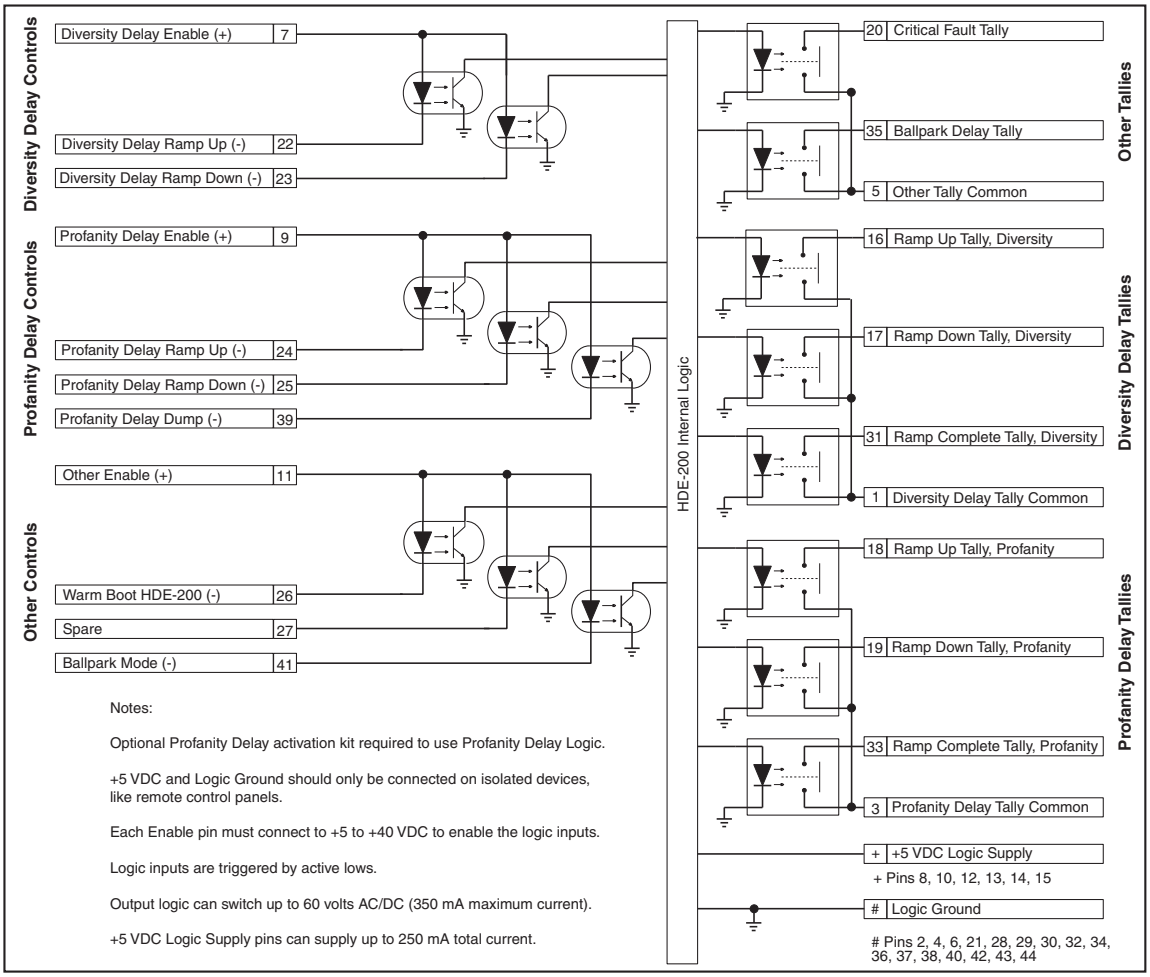
Each input section must be enabled by jumpering its Enable pin to a + voltage source like +5 VDC (logic signals from +5 to +40 volts can be used). Logic inputs are activated by pulling the input pin low.

When a studio remote panel is connected, the enable pins are jumpered to +5 VDC Logic Supply pins. Likewise, the remote panel switches are typically commoned on the panel, which is tied to a Logic Ground pin in order to generate the low logic. This is shown in the **Using a Studio Remote Panel with the HDE-200** illustration on page 2-9.

Logic Outputs

Each logic output section has its own Tally Common connection that can connect to either a + voltage or to ground, depending upon the application.

The logic outputs (tallies) typical drive LEDs in a studio remote panel. One end of all of the status LEDs on the studio panel are typically commoned together to connect to the +5 VDC


Diversity Delay Controls
Diversity Delay Enable (+) 7
Diversity Delay Ramp Up (-) 22
Diversity Delay Ramp Down (-) 23
Profanity Delay Controls
Profanity Delay Enable (+) 9
Profanity Delay Ramp Up (-) 24
Profanity Delay Ramp Down (-) 25
Profanity Delay Dump (-) 39
Other Controls
Other Enable (+) 11
Warm Boot HDE-200 (-) 26
Spare 27
Ballpark Mode (-) 41
HDE-200 Internal Logic
20 Critical Fault Tally
35 Ballpark Delay Tally
5 Other Tally Common
Other Tallies
16 Ramp Up Tally, Diversity
17 Ramp Down Tally, Diversity
31 Ramp Complete Tally, Diversity
1 Diversity Delay Tally Common
Diversity Delay Tallies
18 Ramp Up Tally, Profanity
19 Ramp Down Tally, Profanity
33 Ramp Complete Tally, Profanity
3 Profanity Delay Tally Common
Profanity Delay Tallies
+ +5 VDC Logic Supply
+ Pins 8, 10, 12, 13, 14, 15
# Logic Ground
# Pins 2, 4, 6, 21, 28, 29, 30, 32, 34, 36, 37, 38, 40, 42, 43, 44
Notes:
Optional Profanity Delay activation kit required to use Profanity Delay Logic.
+5 VDC and Logic Ground should only be connected on isolated devices, like remote control panels.
Each Enable pin must connect to +5 to +40 VDC to enable the logic inputs.
Logic inputs are triggered by active lows.
Output logic can switch up to 60 volts AC/DC (350 mA maximum current).
+5 VDC Logic Supply pins can supply up to 250 mA total current.

Remote I-O Logic Interface Block Diagram

Logic Supply. To drive this design, the Tally Common pins are jumpered to Logic Ground so that an active low output turns on the status LEDs.

In some designs the status LEDs are commoned together to ground. In this case, the Tally Common pins are jumpered to the +5 VDC Logic Supply pins so that an active high output turns on the status LEDs.

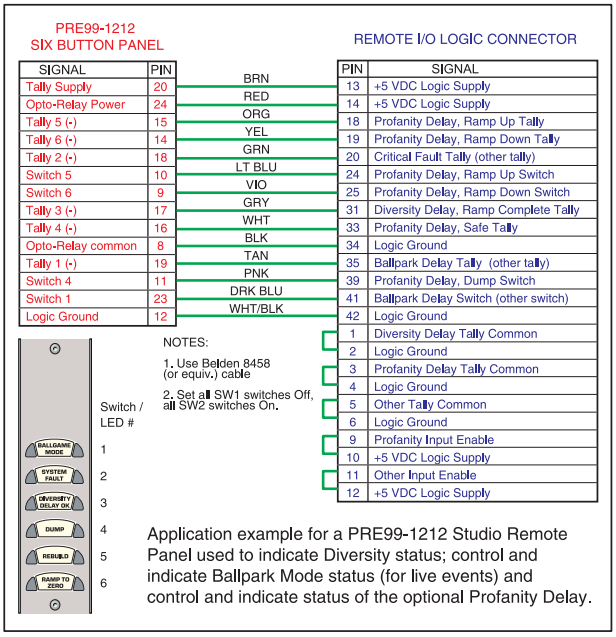
Regardless of how the solid-state relays are connected, they can switch up to 60 volts, AC or DC, and carry up to 350 mA of current. Again, if the tally outputs are driving an active peripheral device, the Tally Common and Tally output pins should only connect to that device. There should be no connection made to any +5 VDC Logic Supply or Logic Ground pin.

Using the Remote I/O Logic Connection

The *Remote I-O Logic* interface is enabled or disabled in the ECC app (for usage details see the Software and User chapters). When disabled, all inputs and outputs are disconnected. The default setting is enabled.

In most cases, a studio remote panel is used in conjunction with the Profanity Delay upgrade option to give the board operator control over the Profanity Delay.

NOTE: To use the Profanity Delay controls/tallies, a Profanity Delay Upgrade Option must be installed.



Using a Studio Remote Panel with the HDE-200

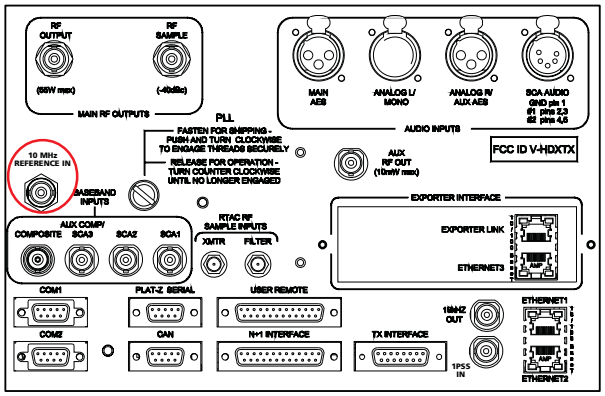
The Diversity Delay controls are typically not available in the studio, but the Diversity Delay Ramp Complete tally can be used for a studio indication that the Diversity Delay is active.

A Ballpark mode switch and tally can also be used in the studio to give local control over temporarily ramping the Diversity Delay to zero so that live events that are being simulcast (like a football game) can be delivered in real time to the analog broadcast chain. This control also typically sets the HD Radio blend feature to off.

As shown above, the Harris PRE99-1212 Six Button Remote panel can be configured for status and control of the Ballpark Mode and the optional Profanity Delay, as well as show the status of a critical failure alarm and the Diversity Delay.

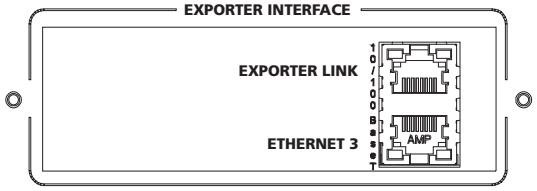
2.3.7 HD RADIO EXCITER CONNECTIONS

When the HDE-200 is co-located with the HD Radio Exciter, a separate GPS antenna connection on the Exciter is not required. To synchronize the Exciter to the HDE-200 Exporter connect the *10 MHz* clock output from the HDE-200 to the Exciter's 10 MHz Reference Input.



HDX-FM Exciter Connections, Detailing the 10 MHz Connection

The HD Radio main channel audio, part of the HD Radio data stream sent out of the Exporter's Ethernet ports, must be sent to and received by the HD Radio Exciter. The *Exporter Link* port is specifically designed to receive the E2X data stream from the Exporter when using TCP or UDP.



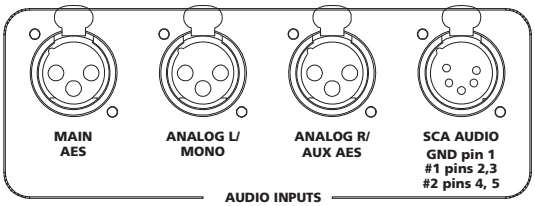
Exporter Link Connection on an HDX-FM Exciter

In order to properly route the data stream, the correct network settings must be defined on both the Exporter and the Exciter. Complete software configuration of the Exporter is detailed in the Software chapter.

2.3.8 FM EXCITER CONNECTION

When the HDE-200 is co-located with the FM Exciter—regardless of whether or not the FM Exciter is part of the HD Radio Exciter, the FM Exciter's input is connected to the *Main Delay Out*.

On the Harris HDX-FM Exciter, connect the Exporter to the *Main AES* connection. If the FM Exciter used does not have an AES input, an AES/EBU-to-analog signal converter is required.



FM Analog Broadcast Input on an HDX-FM Exciter

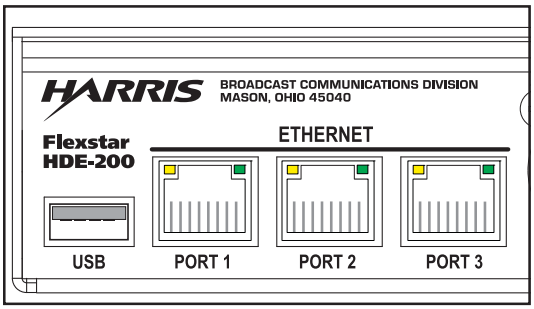
2.3.9 NETWORK CONNECTIONS

The HDE-200 does not require that a computer be networked with it at all times, but one is required to set up the HDE-200's network settings, the Diversity Delay and Profanity delay settings and the other HDE-200 operational settings.

The admin computer can be any laptop or desktop computer with an Ethernet port, running Windows™ XP (SP2 or later), Vista Pro, or Windows 7 Pro, and the HDE-200 Exporter Control Center (ECC app). It can directly connect to any of the three Ethernet ports on the HDE-200 for complete security. The other two ports can be used to connect the HD Radio Exciter and an HD Radio Importer.

Any of the HDE-200 Ethernet ports can alternately be connected into a facility LAN in order to use an engineering department computer as the admin computer.

Note: The HDE-200's network settings must be set before it is connected into the facility's network. This is done either directly from the ECC app or by using a USB flash drive (the flash drive supplied with the HDE-200 can be used for this purpose). The flash drive plugs into the rear USB port on the HDE-200 to first capture the current settings and to then upload new configuration settings by resetting the HDE-200. Refer to the *Software* chapter for network configuration details.



HDE-200 Network and USB Connections

Once the HDE-200's network settings have been changed from the default settings, the admin computer can be networked with the HDE-200 and the ECC app used to set the various HDE-200 configurations directly over the network. These settings are then maintained in the HDE-200 using flash memory.

Software

3

The HDE-200 does not need to be networked with an admin computer during normal operation, but a WinXP (SP2 or later), Vista (Business or Ultimate), or Windows 7 (Ultimate or Pro) computer is needed to configure and monitor the HDE-200 using the *Exporter Control Center* program (the ECC app). The ECC app is supplied with each HDE-200 on a USB flash drive. The ECC app can also be downloaded from the Harris Broadcast Customer Portal (see page 5-1 for website access details).

3.1 ECC App Overview

The ECC app has two main functions: to configure HDE-200 Exporter operational parameters; and to allow multiple users to remotely monitor and/or control one or more HDE-200 Exporters. The ECC app can be run concurrently on any number of computers on your network, if desired.

NOTE: ECC app security is NOT turned on during installation (for easy ECC app and HDE-200 Exporter setup). If security will be used, assign Users to the four User Groups before clicking **Enable Security**, in the *System > Preferences* pop-up window, to activate User Group security.

If security is enabled in the ECC app, there are five security levels that allow varying levels of access and control over the ECC app and any networked HDE-200 Exporters.

Four User Groups are added to the Windows operating system when the ECC app is installed. The various user group members are assigned using the standard Windows Manage Local Users and Groups function.

The four User Groups, summarized in the table below, allow specific program access and control to be assigned to each ECC user using your facility's computer login names and passwords.

User Group	Description
No Credentials	Can select & view any HDE-200
Censor	Can select & view any HDE-200 and issue Profanity dump commands
User	Can select & view any HDE-200 and control normal operational features on the HDE-200
Engineer	Has control over most HDE-200 configurations, but cannot make network changes
Commissioner	Has full control over the HDE-200 configuration, including network configuration changes

If someone logs into a computer and starts the ECC app, but is not a member of any of the groups, then that person is a No Credentials user with limited control over the ECC app and no control over any HDE-200. Here is a summary of the control functionality for the four HDE-200 User Groups and a non-credentialed user:

A **No Credentials** user is anyone who logs into a computer with the ECC app but is not a member of any ECC User Group. If they open the ECC app the standard HDE-200 monitor screen can be viewed. They can also change which HDE-200 is being monitoring and select between pre- and post-delay metering, but most other menu items are grayed out.

A **Censor** is one step above a **No Credentials** user: they have the same basic signal level monitoring and selection abilities and most menu items are grayed out. The difference: a Censor, typically assigned to show producers when the optional Profanity Delay feature is active, have control of the Profanity Delay dump button.

A **User** has the same privileges as a Censor but also has basic control over the Diversity Delay (the Ramp Up/Down buttons are active). If the Profanity Delay is installed, a User also has control over Dump, Ramp to Zero, and Rebuild. This user group is for nontechnical station personnel like board operators.

An **Engineer** has almost full ECC app access, and hence, can change most HDE-200 operating parameters. Anything but network settings can be adjusted, saved, and then uploaded to the HDE-200. This user (along with a Commissioner) can also upgrade the operating system on the HDE-200 or the ECC app itself. This access level should be limited to the engineering staff with direct responsibilities for the HDE-200 Exporters.

A **Commissioner** is the super user (like a computer administrator). They have full access to all ECC app features including the ability to change the HDE-200 network settings. This setting is for the chief engineer and for IT techs or system installers that need to change network settings (IP address, subnet, etc.) on the HDE-200 Exporters.

The table illustrates the specific control permissions for the four HDE-200 User Groups and the No Credentials user. Note that you do not have to set up and use these User Groups when the ECC app is being run under the control of the engineering staff on a secure administration PC.

Again, these User Groups are not activated in the ECC app until the **Enable Security** button, in the *System* > *Preferences* pop-up window, is clicked. At that time the User Groups are activated to allow different people, with different levels of permission, to alternately use the same ECC app on any networked computer.

		HDE-200 User Group				
		Commisioner	Engineer	User	Censor	No Credentials
File	Logon / Logoff	Control	Control	Control	Control	Control
Device	Selection	Control	Control	Control	Control	Control
Profanity Dump		Control	Control	Control	Control	View
Ramp Up / Down		Control	Control	Control	View	View
Delay Control	All Parameters	Control	Control	Control	View	View
Profanity	All Parameters	Control	Control	Control	View	View
System	Mode Control	Control	Control	View	View	View
	Station Information Service	Control	Control	View	View	View
	Other Controls	Control	Control	View	View	View
	GPS Configuration	Control	Control	View	View	View
	Upgrade Devices	Control	Control	View	View	View
	Preferences	Control	View	View	View	View
	Flash Drive Configuration Utility	Control	View	View	View	View
	Show Signal Chain	View	View	View	View	View

HDE-200 User Access Summary

When a user logs into Windows and launches the ECC app, his User Group credentials (or lack thereof) define which functions can be performed in the ECC app, as outlined above.

NOTE: If multiple users access a computer running the ECC app, always close the ECC app (and the Logger utility if it is running) before logging off the computer. If this is not done, a port error will be shown when another user opens the ECC app, and security settings, if active will be compromised.

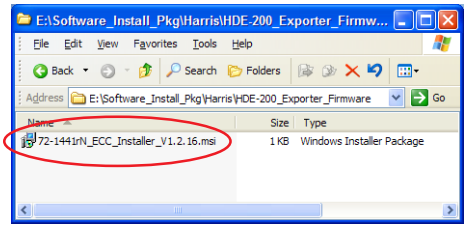
3.2 Installing the ECC App

The ECC app is supplied on a USB 2.0 flash drive (Harris p/n 7320514000-1), along with other administration apps and PDF files.

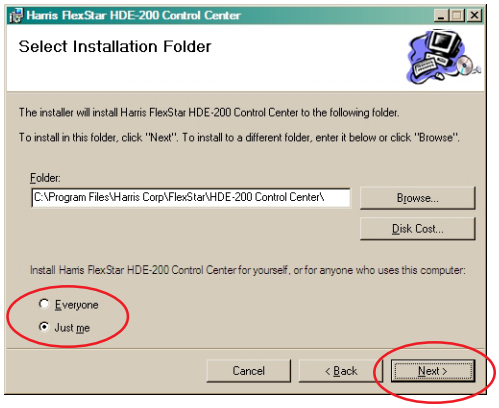
The illustrations used in the following instruction show WinXP screens. When the ECC app is installed on a Windows 7 computer, see the Harris App Note AN10-02 ECC & Windows 7 (included as Appendix A) for installation tips pertaining specifically to Windows 7.

1. Locate the HDE-200 installation file on the USB flash drive (F:\Software_Install_Pkg\Harris\Exporter Control Center\72-1441rN_ECC_ Installer_V1.2.16.msi)

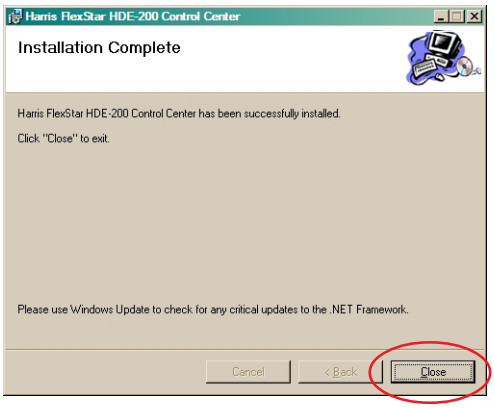
2. Launch the installation file by double clicking the **.msi** file.



3. Click *Next* to open the *Select Installation Folder* screen. For best results, use the default file location. Before continuing, set the program access. Use *Just Me* (default) if the currently logged-in administrator is the only one using the app on that computer. Use *Everyone* when multiple users will log into the computer and need to access ECC.


Harris FlexStar HDE-200 Control Center
Select Installation Folder
The installer will install Harris FlexStar HDE-200 Control Center to the following folder.
To install in this folder, click "Next". To install to a different folder, enter it below or click "Browse".
Folder:
C:\Program Files\Harris Corp\FlexStar\HDE-200 Control Center\
Browse...
Disk Cost...
Install Harris FlexStar HDE-200 Control Center for yourself, or for anyone who uses this computer:
Everyone
Just me
Cancel
< Back
Next >

4. Continue the installation by clicking *Next* on the *Select Installation Folder* screen and on the following screen. Once the installation completes, click *Close* to close the installer window.


Harris FlexStar HDE-200 Control Center
Installation Complete
Harris FlexStar HDE-200 Control Center has been successfully installed.
Click "Close" to exit.
Please use Windows Update to check for any critical updates to the .NET Framework.
Cancel
< Back
Close

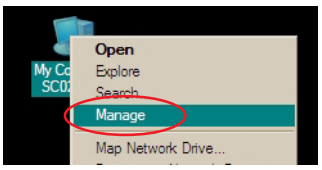
3.2.1 USER GROUP SETUP

The ECC app automatically creates four Windows User Groups to allow different users to have varying access to the ECC app's features. If the ECC app is only used on an access-controlled computer, and only accessed by station engineers, then these four User Groups do not need to be assigned. But, in this case, DO NOT CLICK on **Enable Security**, in the *System* > *Preferences* pop-up window to run the ECC app without security.

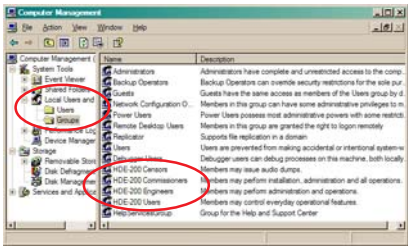
The HDE-200 User Groups are maintained even if the ECC app is removed from the computer so a new app version can be installed maintaining the same User Groups. These instructions pertain to WinXP computers, see Appendix A for steps specific to Windows 7 and Vista computers.

NOTE: Only a computer *Administrator* can add or remove users in the HDE-200 user groups.

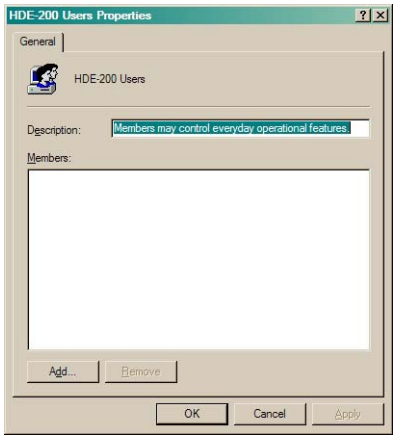
1. To add or remove users from an HDE-200 user group, right click on the *My Computer* icon and select *Manage*.



2. Expand the *Local Users and Groups* tab in the left pane, then select *Groups* to show the various user groups defined on the computer. The right-hand pane lists the four HDE-200 user groups.



3. To add or remove users, double click the HDE-200 Group name to open its properties window. A list of the current users in that group is displayed.



User Group Properties Window

4. To add a new user to the group, click *Add…*, which opens a *Select Users, Computers, or Groups* window. Type in the new users' Windows login names in the *Enter the object names to select* dialog box. To enter multiple names, separate each name with a semicolon (;). For example, if you want to add both John Doe, who logs in as **jdoe**, and Phil Smith, who logs in as **psmith02**, then type in: **jdoe;psmith02**.

If users must log into Windows using a network domain (an optional feature), the network domain name must be included. If John Doe logs into the computer using the ACME domain, then **ACME\jdoe** would be the user name.

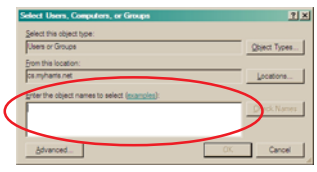
If no network domain is specified, use the local computer name in place of the network domain name. For example, to add a new user, ***jcommissioner***, who is already an existing Windows user, to the **HDE-200 Commissioners** group on a local computer named **Local_Computer**, perform the following steps:

a) In the *HDE-200 Commissioners Properties* window, click *Add…*

b) In the *Select Users, Computers, or Groups* window, click *Locations…*

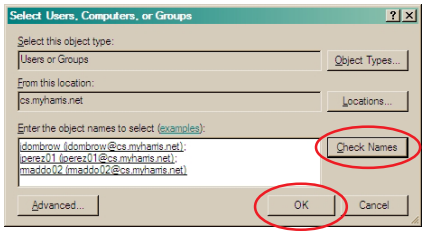
c) Select the name of the local computer (e.g., **Local_Computer**), then click *OK*.

d) Type in the username (i.e., **jcommissioner**) in the *Enter the object names to select* dialog box.



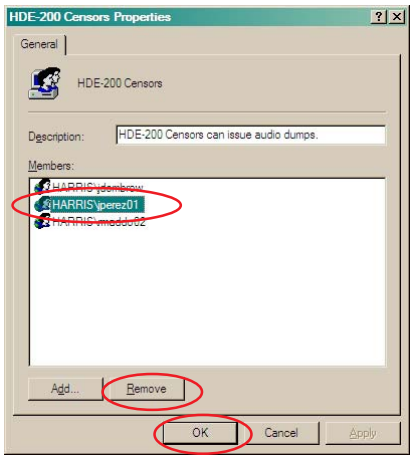
e) Click on the Check Names button and verify that the username is valid. If the user-

name is valid, the displayed name will automatically update to append the local computer name to the username (**LOCAL_COMPUTER\ jcommissioner**).



f) Click *OK* to close the *Properties* window.

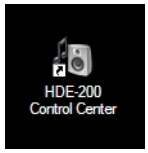
To remove a user, open up the properties window for that group. Click on a name to highlight it, then click *Remove*.



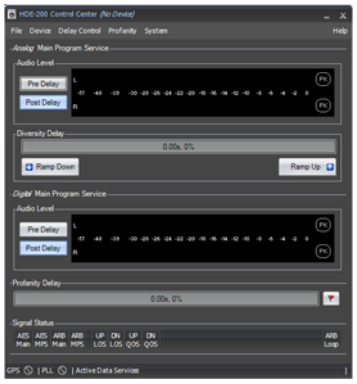
As an *administrator*, always log off the computer, once the user group privileges have been set, so that the next person logging in has the proper access to the ECC app.

3.3 Starting the ECC App

An ECC app shortcut icon was added to the computer's desktop during installation. Double-click the icon to launch the ECC app.



Alternately, use the Windows *Programs* menu to start the ECC app: *Start* > *Programs* > *Harris Corp* > *FlexStar* > *HDE-200 Control Center*.

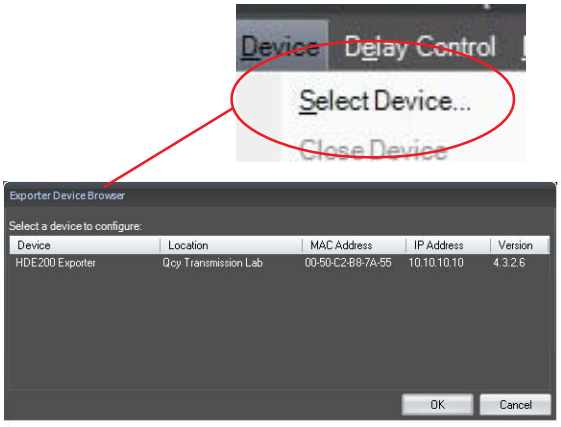


Main Window, with no HDE-200 Selected

The first time the ECC app is run ***(No Device)*** is shown in the title bar. This indicates that an HDE-200 has yet to be selected as the monitor source.

If any HDE-200s are already configured and connected to the network (see page 2-10 for connection information), select an HDE-200 to monitor by clicking *Device* > *Select Device* to open the **Exporter Device Browser** window.

NOTE: If the admin computer has multiple NICs, verify the correct NIC is assigned as the **Flexstar Network Interface** in the *System* > *Preferences* pop-up window (see page 3-21).



Exporter Browser Window

The Exporter Browser Window shows all of the Harris HDE-200s it has detected on the local network. To select a device double-click on its name (or click to highlight its entry, then click *OK*, or press *Enter* on the keyboard) to select that HDE-200 and close the window.

The selected HDE-200's current status and configuration information is transferred to the ECC app. If audio is going through that HDE-200, the audio meters will show the audio levels for the Analog and Digital Main Programs.

If a new HDE-200 is being added to the network, then the HDE-200 must typically first be configured for the facility's network, off-line, before being physically connected to the network and subsequently appear in this list.

Network configuration can be done in two ways: by using a USB flash drive to copy and move the HDE-200 configuration information to the ECC app for editing (the "sneaker net" method); or by setting the NIC on a computer running the ECC app to be 10.10.10.2 so it can be directly networked with the new HDE-200 ("direct" method).

Here are the default network settings assigned to the HDE-200 at the factory:

HDE-200 Default Network Settings

Device	IP Address
HDE-200 CPU	10.10.10.10
HDE-200 DSP	10.10.10.22
HDE-200 Gateway	10.10.10.1
HD Radio Exciter	10.10.10.11
HD Radio Importer	10.10.10.9

HDE-200 Net Mask: 255.255.255.0

NOTE: These settings will most likely NOT match those needed by the HDE-200 to function in an existing network. DO NOT CONNECT the new HDE-200 to your network until its network settings are changed using the following procedure.

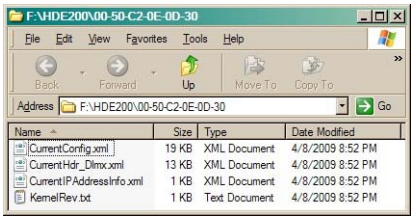
3.4 Editing the HDE-200 Network Settings

To edit the network settings for a new HDE-200 using the "direct" method, install the ECC app onto a laptop or desk computer with the IP address of 10.10.10.2. Directly connect the computer to port 1 on the new HDE-200. Then select the new HDE-200 in the *Device* > *Select Device* browser window (shown on page 3-5). Select the *System* > *Address Configuration Utility* to open the **Configuration Window** and follow the instructions from step 5 onwards to edit the network settings.

When the ECC app is running on a networked computer that is already connected to other Flexstar devices, use the "sneaker net" method by using a USB flash drive to move the settings from the new HDE-200 to the computer by following the instructions from step 1 onwards.

NOTE: With either method the ECC app must be set for no security, or you must be logged in as a Commissioner, in order to edit the network settings on the new HDE-200.

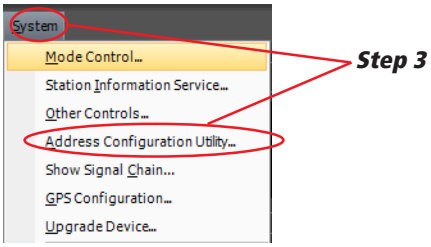
1. Insert a blank USB flash drive, 32 MB or larger, into the new HDE-200's USB port (rear panel, near the Ethernet jacks). **Wait a minute** for the HDE-200 to detect the flash drive and to write its current configuration settings to the drive. Various *.xml* files are saved in a folder, labeled by that HDE-200's MAC address, inside a new *HDE200* folder.


F:\HDE200\00-50-C2-0E-0D-30
File Edit View Favorites Tools Help
Back Forward Up Move To Copy To
Address F:\HDE200\00-50-C2-0E-0D-30 Go
Name Size Type Date Modified
CurrentConfig.xml 19 KB XML Document 4/8/2009 8:52 PM
CurrentHdr_Dlmx.xml 13 KB XML Document 4/8/2009 8:52 PM
CurrentIPAddressInfo.xml 1 KB XML Document 4/8/2009 8:52 PM
KernelRev.txt 1 KB Text Document 4/8/2009 8:52 PM

Flash Drive Folder with the HDE-200 Files

2. Move the USB flash drive from the HDE-200 to a USB port on the computer running the ECC app. Wait a moment for the USB flash drive to be recognized by Windows.

3. Click *System* > *Address Configuration Utility* to open the **Configuration Window**.

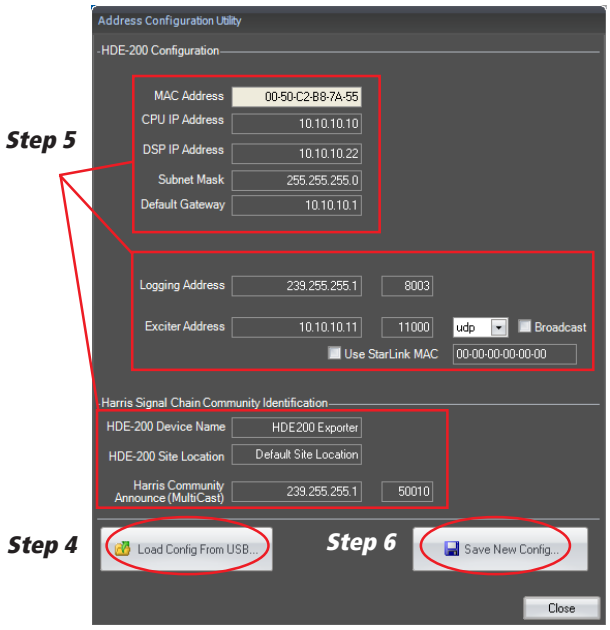


4. Click *Load Config from USB...* to open a File Selection window. Navigate to the folder with the new HDE-200's config file (e.g., **E:\HDE200\00-50-C2-0E-0D-30**). Click *OK* to load the settings. The settings will be changed to reflect the new HDE-200's default settings.

5. The *Address Configuration Utility* window shows the current settings for the new HDE-200 (as selected in the *Device* > *Select Device* browser window when the computer is directly connected to the new HDE-200, or by clicking the *Load Config From USB* button in step 4).

   The new HDE-200's default settings should be like those shown in the illustration on this page. These settings **are typically** changed to fit into the facility's network.

   • Set the CPU and DSP IP Addresses, Subnet Mask and Default Gateway Address, as required, for your network. The CPU is the 9260 Linux board which is the signal processor for the analog and profanity delays. The DSP is the iBiquity HD Radio processor or Exgine board in the Exciter.



HDE-200 Configuration Window

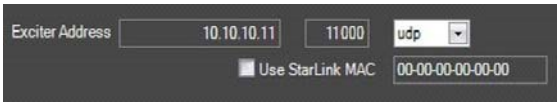
   • If required, change the Logging Address IP and Port, although these are normally left set to their default settings.

   • Set the Exciter IP address. Three transmission methods may connect the HDE-200 to one or more Exciters, detailed in the Link Configuration Details sidebar, shown on the next page. The Port and Protocol are typically set to: 11000 and UDP, respectively.

   • Enter a unique name for this HDE-200 and its site location. Typically the Device Name includes call letters or other signal identifier, while the Site Location could identify the city, if the HDE-200 is remotely accessed on the same subnet, or give its specific location (TOC, air studio, transmitter shack, etc.).

6. Once all changes are made, click *Save New Config...* When a USB flash drive was used to move the configuration files to the ECC app, a file selection window opens so the USB flash drive can be select. Click *OK* to

Exciter Link Configuration Details



Use one of three HDE-200 transmission modes:

1. Unicast (to connect to one Flexstar Exciter using a local network or a bidirectional TCP/IP-capable STL, e.g. an Intraplex STL HD or Moseley Starlink 9003T1)
- Enter the Flexstar Exciter's Exporter Link IP address (e.g., 10.10.10.11) as the Exciter Address.
- Select port 11000 and UDP protocol. Contact Harris field service if there is a compelling reason to use TCP.
- Verify Use StarLink MAC is unchecked.

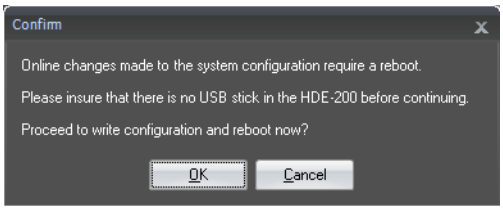
2. Unidirectional Unicast (to connect to a Flexstar Exciter, using its MAC address, over a unidirectional STL path, e.g. Harris HD Link or Moseley StarLink 9003Q)
- Enter the Flexstar Exciter's Exporter Link IP address (e.g., 10.10.10.11) as the Exciter Address.
- Select port 11000 and UDP protocol.
- Check mark Use StarLink MAC.
- Enter the MAC address of the FlexStar's Exporter Link as shown in the FlexStar GUI, Serial Setup, screen 4/4.

3. Unidirectional Subnet Broadcast (allows multiple Exciters to be fed from this HDE-200 over any type of non-routed path)
-Enter the Exciter Address, but use .255 in the last octet (e.g., 10.10.10.255). All devices with addresses from 10.10.10.1 to 10.10.254 will then receive the HDE-200 packets. NOTE: All network switches between the HDE-200 and the FlexStar Exciter or STL must be set to allow broadcast packets to pass through to the desired destination ports. Also, consult with your IT group before implementing this feature.
- Verify Use StarLink MAC is unchecked.
- Select port 11000 and UDP protocol.

Additional Note: Do not allow the Exporter's E2X traffic into the Exciter's Ethernet 3 port. Also, do not allow duplicate IP addresses to be set on any Exciter Ethernet port, leave all unused ports set for DHCP.

write a *NewIPAddressInfo.xml* file to the MAC address folder on the flash drive.

If the HDE-200 is directly connected to the computer, then a warning pop-up box appears to confirm that you want to upload the changes to the HDE-200. Click *OK* to write the files and cause the HDE-200 to reboot. See step 9 for the results. Click *Cancel* to not upload the new configuration to the HDE-200.


Confirm
Online changes made to the system configuration require a reboot.
Please insure that there is no USB stick in the HDE-200 before continuing.
Proceed to write configuration and reboot now?
OK
Cancel

7. When using "sneaker net" to transfer the new settings to the HDE-200 remove the USB flash drive from the computer and insert it back into the HDE-200's USB port.

CAUTION: Right click on the *Safely Remove Hardware* icon in the Windows system tray to select the USB device (e.g., *Safely remove USB Mass Storage Device*) before unplugging it.

8. With the USB flash drive inserted into the USB port on the HDE-200, press the *RESET PROCESSOR* button on the rear panel to restart the HDE-200. This causes the updated files to be read, and stored, in the HDE-200 flash memory.

9. As the HDE-200 restarts and reads the updated network configuration information, **START-UP** is displayed on the front panel. When this display goes away, the HDE-200 has updated its file settings, automatically overwriting the original configuration *.xml* files with the new settings. The new HDE-200 can now be connected to the facility LAN.

To view the new HDE-200 on any ECC app, click *Device* > *Select Device* and double-click on the desired HDE-200 name in the **Exporter Device Browser** window.

If audio is going through that HDE-200 it will immediately appear in the meters. The device name will appear at the top of the ECC window.

Backing up the New Configuration Files

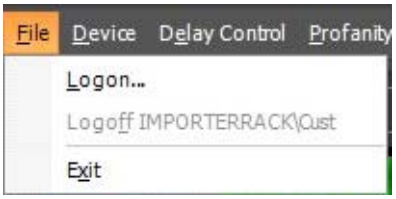
When the direct connection method is used to update the HDE-200 files, follow steps 1 and 2 in order to write a MAC address-named folder from the updated HDE-200 to the USB flash drive. Use Windows Explorer to then backup that folder to the admin computer.

When the USB flash drive method was used to set the new configuration, move the USB drive back to the admin computer to backup the MAC address-named folder using Windows Explorer.

3.5 HDE-200 Configuration

With the newly updated HDE-200 shown in the ECC app, the various operational settings (Diversity Delay time, Profanity Delay time, activating the Profanity Delay remote control, assigning GPS options, assigning Blend options, etc.) can now be edited as desired. This section also presents an overview of each ECC menu item and their pop-up window settings.

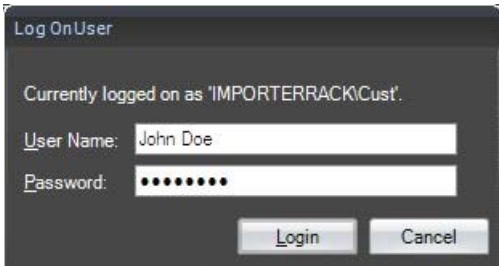
3.5.1 FILE MENU



File Menu Items

The File menu provide a means for an alternate user (like an Engineer or Commissioner) to gain immediate access to the ECC app, with elevated privileges, by logging into the app to make changes and then logging off. The current user then logs back into the ECC app with their level of access.

As an example of how User Groups are used, assume the current user is a Censor. This user group can control Profanity Dump operations and select which HDE-200 to view but not much else.



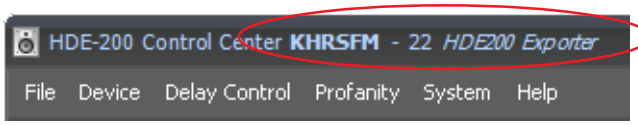
User Log On Dialog Box

If an Engineer User needs to make an urgent adjustment of the HDE-200 settings, they simply log in using the *File* > *Logon* pop-up window, the ECC app is now running with their level of credentials. When finished, the Engineer logs off the app, and the original user logs back on, returning the permission level back to Censor.

3.5.2 DEVICE MENU

Device Menu Items

The *Device Menu* is used to change which HDE-200 is currently communicating with that ECC app. The currently connected HDE-200 is shown in the title bar of the ECC window:

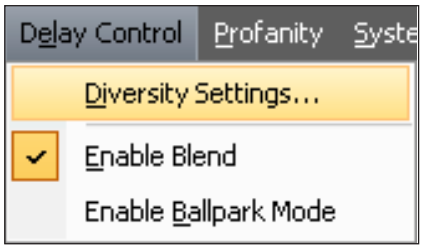


Current HDE-200 Shown in ECC Window Title Bar

To change the current device, click *Device* > *Select Device...* to open the *Exporter Device Browser* window (shown on page 3-5), which shows each HDE-200 Exporter connected to the network. Double-click an HDE-200 Exporter name to select it for monitoring (or editing with an Engineer or Commissioner User).

NOTE: Always confirm which HDE-200 the ECC app is connected to—especially when there are multiple HDE-200 Exporters in the network, before editing any settings.

3.5.3 DELAY CONTROL MENU



Delay Control Menu Items

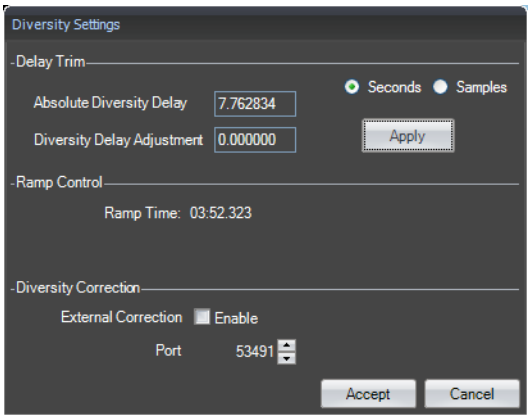
This Menu is where the Diversity Delay settings are defined and where the HD Radio mode: **Enable Blend** or **Enable Ballpark Mode** is set.

Because of the significant time difference between the HD Radio signal (due to its encoding, transmission, and decoding processes) and the analog signal transmitted via standard FM, for the HD Radio tuner to seamlessly blend from the analog signal to the HD Radio signal, the analog broadcast signal must be time delayed by multiple seconds to stay time-aligned with the HD Radio signal.

3.5.3.1 Setting the Diversity Delay

Up to twelve and half seconds of *Diversity Delay* can be set in the HDE-200. But before one adjusts the **Diversity Delay** setting, **Enable Blend** must be checked and the Diversity Delay must be fully ramped up (the main ECC display shows the Diversity Delay at 100%).

Click *Diversity Settings...* to open the Diversity Settings pop-up window. Fine tuning of the Diversity Delay time can be done using this window, but to accurately do this requires that either a professional HD Radio receiver be used so that direct correlation measurements can be used or so that



Diversity Settings Window

the receiver can be set to "Split Mode" where the decoded HD Radio signal audio feeds one channel (typically, the left channel) while the received analog broadcast audio feeds the other channel (typically, the right channel).

Connect a dual-channel oscilloscope to the HD Radio receiver audio outputs (while it is in *Split Mode*) to accurately align the two signals visually while "tweaking" the delay setting in the Diversity Settings pop-up window.

Here are some tips to get you started:

1. Start with an initial setting of roughly seven seconds. This setting is often associated with a particular Exciter, so also refer to the HD Radio Exciter's manual about their recommended Diversity Delay.

2. Use program material with plenty of peaks and silence (like spoken word) instead of music so that the delay or time difference between the two signals is most easily seen.

3. Progressively "zoom in" the scope as the two signals are more closely aligned.

Delay Trim

The current Diversity Delay time (Absolute Diversity Delay) is shown in the Delay Trim section of the window in seconds (the default setting each time the window is opened) or in the number of audio samples the signal is being delayed (each

audio sample is 1/44,100 of a second or 22.7 microseconds).

Adjusting the delay time can be done by double-clicking the Absolute Diversity Delay time (which then turns blue) and entering a new delay time. The Diversity Delay Adjustment entry can be used to add or subtract time to the existing Diversity delay. In either case, click Apply to change the delay time. Note that the delay time will then ramp to the new setting using the Ramp Mode.

To view the delay by Samples, click the Samples radio button. The same entry methods (double-clicking the Absolute Diversity Delay entry or entering an adjustment into the Diversity Delay Adjustment entry box) as used with Seconds can be used with Samples.

A rough determination of the HD Radio signal to analog delay difference can be determined by simply listening to the two signals in Split Mode. An audio source with speech, rather than music, will best facilitate this process. A time difference of greater than 0.2 seconds is clearly discernible. If the analog signal arrives before the HD signal, then more delay is needed and vice-versa.

To more precisely adjust the Diversity Delay, view the two signals on a dual trace oscilloscope or use a dedicated HD monitor like the Audemat Golden Eagle HD.

Ramp Control

The Ramp Control Section simply shows how much time, in minutes:seconds.hundreds of seconds, that it takes to ramp up from no delay to the Absolute Diversity Delay set in the Delay Trim section.

The actual amount of the ramp time is affected by both the Diversity Delay time itself and by which Ramp Mode is selected in the *Systems > Other Controls...* setup window. When **Linear** or **Soft Ramp** is active, the ramp time shown is accurate. When **Smart Ramp** is active the time shown is the maximum ramp time. The actual ramp time may be much shorter, especially with spoken word programming.

Diversity Correction

Checking **External Correction Enable** will allow an external "Audio Time Correlation Measurement Device" to post delay correction values, via Ethernet, to the HDE-200. These correction values are only utilized when the Diversity Delay is not being altered (e.g., not being manually adjusted and not ramping up or down).

The Port used by the particular Time Correlation device is also set in this part of the window using the Up/Down arrows.

Note that at this time there are no HD receivers that incorporate this feature, thus it is not normally enabled.

Saving the Diversity Delay Settings

Once the delay is set (the HD Radio audio and analog FM audio are in phase with no time difference), click *Accept* to store the Absolute Diversity Delay Value and other settings in this window to the nonvolatile memory of the HDE-200 and to close the window.

The delay value will now be the target during all subsequent Ramp Up commands. If the delay was ramped up at the time of an accidental power outage, the Exporter will automatically ramp back to that delay target at power restoration.

To discard all changes made to the Absolute Diversity Delay value, and to the other sections of this window, click *Cancel* to close the window. The HDE-200 will then ramp to the previous Absolute Diversity Delay value.

3.5.3.2 Enable Blend

The Exporter adds a control signal to the HD Radio stream that tells an HD Radio receiver what to do when the HD Radio signal is interrupted or

too weak to be received properly. When **Enable Blend** is checked, the receiver blends from the HD Radio signal back to the analog broadcast signal.

The **Enable Blend** setting affects how the HD Radio receivers operate, which means that it also affects how much Diversity Delay is required to align the analog broadcast with the HD Radio signal. Since **Enable Blend** is normally checked, you should ensure that it is checked prior to setting the Diversity Delay.

To set the Enable Blend option, click on the *Delay Control* menu item, then click **Enable Blend** to check the option.

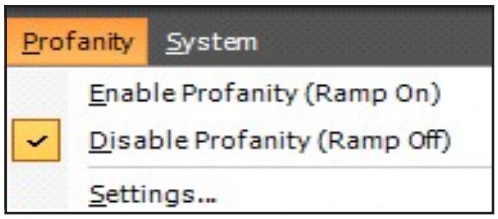
3.5.3.3 Enable Ballpark Mode

Clicking on *Enable Ballpark Mode* will check mark this option (unchecking *Enable Blend*) and will immediately begin ramping down the Diversity Delay to zero.

This function can be used for live broadcasts of sporting events so that the FM broadcast listeners at the ballpark will hear a low latency signal (although most likely there will still be Profanity delay of several seconds). The *Enable Blend* function will be temporarily overridden and the blend bit turned off in the HD Radio stream.

Ballpark mode is canceled by either sending a cancel Ballpark mode command from a Studio remote panel or by clicking *Enable Blend*.

3.5.4 PROFANITY MENU



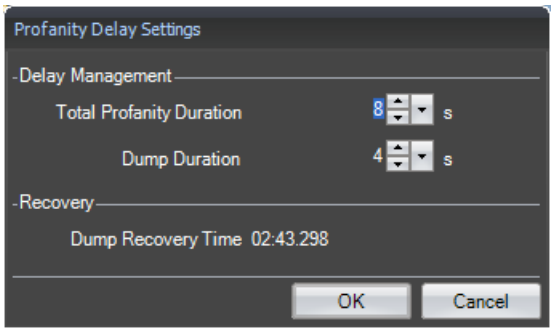
Profanity Menu Items

The HDE-200 Exporter has an optional feature that can provide up to thirty-five seconds of profanity delay protection. Profanity delay controls and the profanity delay settings are accessed through the *Profanity* menu item. This menu item is grayed out if the optional Profanity Delay feature is not active.

Enable Profanity (Ramp On) and **Disable Profanity (Ramp Off)** are mutually exclusive settings. Checking **Enable Profanity** ramps up the Profanity Delay to the current stored value of Total Profanity Duration. Checking **Disable Profanity (Ramp Off)** causes the Profanity Delay to begin ramping to zero delay.

3.5.4.1 Profanity Delay Settings

Clicking *Profanity* > *Settings...* opens the Profanity Delay Settings pop-up window where the total profanity delay is set along with how much time is dumped per Dump Event. It also shows the recovery time required to build the delay back up after a Dump Event occurs.



Profanity Delay Settings Window

Delay Management Section

The **Total Profanity Duration** and the **Dump Duration** are displayed in seconds.milliseconds. There is some interaction between the two controls since adjusting the Total Profanity Duration can affect the Dump Duration since the maximum Dump Duration is equal to the setting of the Total Profanity Duration.

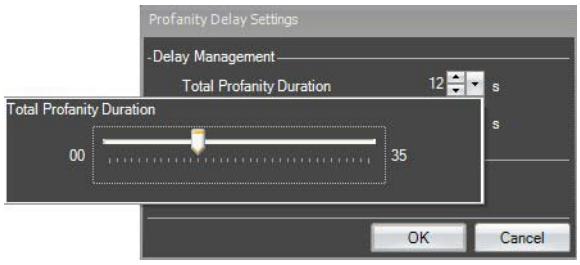
The settings can be changed using one of these methods:

1. Click on a number to highlight it in blue. Press the backspace key to erase the current value, then type in a new value on the keyboard. The value can have a resolution to 0.01 seconds, if desired.

2. Click on a value (it highlights in blue), then use the mouse scroll wheel to increment the value by one second for each forward click or decrement it by one second for each rearward click.

3. Click the up or down arrow button to increment or decrement the value by one second. Click/holding an arrow button gives four continuous increments or decrements per second.

4. Click the large down arrows to pop up a Slider Bar. When the slider is fully left, the Total Profanity Duration, or the Dump Duration, is set to zero seconds. Moving the slider to the right increases the delay or dump duration. The maximum Total Profanity Delay is 35 seconds. The maximum Dump Duration is limited to the setting of the Total Profanity Duration. Clicking on the bar to the left or right of the slider adds or subtracts one second from the Duration. Click/holding the slider bar continuously increments or decrements by one second about two times per second. To close the slider pop-up window, click on any other part of the computer screen.



Profanity Duration Slider Bar

The Scroll wheel method (#2) is probably the easiest and fastest method to set the delay times giving a more than adequate resolution finer than one second.

Click *OK* to save the selected values to the Exporter's nonvolatile memory and close the Profanity Delay Settings window. Click *Cancel* to close the window and ignore any changes. The previously stored values will then be recalled and used.

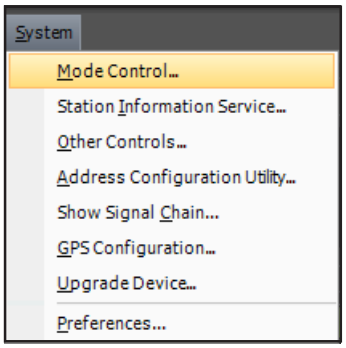
Recovery Section

The Dump Recovery Time is displayed in minutes:seconds.milliseconds. The Dump Recovery Time is calculated by the time set in the Dump Duration and by the selected Ramp Mode.

The **Ramp Mode** is set in the *Other Controls* window. For *Linear* and *Soft Ramp Mode* settings, the time shown is accurate. For the *Smart Ramp Mode* setting, the time shown is the maximum ramp time. The actual ramp time will vary by programming, being much shorter when used with spoken word content.

The time displayed in the window is for the recovery time for a single dump event. Since multiple dumps are allowed, the total recovery time will be lengthened proportional to the number of executed dumps.

3.5.5 SYSTEM MENU

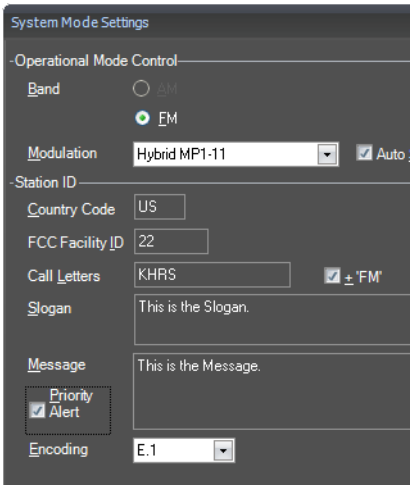


System Menu Items

The System menu items are used for setting additional HDE-200 configurations and to display or control information specific to the FlexStar device community.

3.5.5.1 Mode Control Menu

Click *System > Mode Control...* to open the System Mode Settings window where some of the most basic HD Radio receiver display settings are made.



System Mode Settings Window

Operational Mode Control

The top section of the window is where the modulation **Band** is set. At this time this setting is fixed on *FM* (AM HD Radio will be supported when Flexstar products are released). The **Modulation** mode should be set to *Hybrid MP1-11*.

Station ID

The lower section of this window is where the entries used by the Station Information Service Transport Data (SIS Data) are entered. Note that the current HDE-200 firmware release is in compliance with NRSC document SY_IDD_1020s, Rev F.

The **Country Code** is entered into the Country Code entry box. At this writing, there is little utility in selecting anything other than *US* in this box.

The **FCC Facility ID** is your assigned FCC ID number.

The **Call Letters** is limited to four characters. To add "-FM" to your Call Letters, check the FM check box. If you do not want "-FM" added to your call letters, uncheck the FM check box. In the SIS Data this field is called the Call Sign Standard.

The **Slogan** entry box allows up to 56 alphanumeric characters to be entered. These scroll across the HD Radio display after the Station Name. In the SIS Data this field is called the Slogan Standard. Be sure to edit the default text in this box or else "This is the Slogan" could be scrolling across HD Radio receivers when tuned to your station!

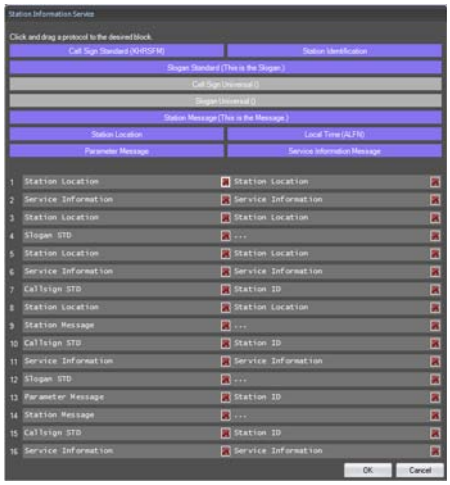
The **Message** (also known as the Station Message in the SIS Data) is a text message of up to 124 alphanumeric characters that scroll across the HD Radio after the Slogan. Be sure to edit the default text in this box or else "This is the Message" could be scrolling across HD Radio receivers when tuned to your station!

Check mark Priority Alert if you want the HD Radio receiver to emphasize the Station Message. How this is done varies by the HD Radio receiver manufacturer, so the message might be in boldface, underlined, in a larger typeface than the Station Name and Slogan, or be surrounded by *ALERT*.

Encoding allows for support of future Unicode character sets, but at this time it should be set to the E.1 encoding method.

3.5.5.2 Station Information Service

Click *System > Station Information Service...* to open the SIS data schedule window. Ten SIS messages are available for scheduling, as shown in the following illustration.



Station Information Service Settings Window

Choices that are not supported in the current iBiquity software release are grayed out (Call Sign Universal and Slogan Universal).

The Station Message box will be grayed out if the Message entry box does not have any text entered in the *System Mode Settings* window.

SIS data is structured into 32 payloads, which constitute one frame. These 32 payloads are divided into 16 blocks of two payloads each and are numbered along the left side of the SIS window.

SIS messages vary by payload requirements. Some messages require a single payload, some require two payloads, or more, to fully deliver their message content. It all depends upon the length of the respective message.

SIS Messages are deployed in the schedule as either single or double message payloads. You are free to schedule your SIS messages however you choose, but there are some restrictions. Single payload messages can generally be placed anywhere, while multiple payload messages must be placed in the first payload of a block leaving the second payload of that block empty.

There are a few arcane restrictions regarding the placement of payloads beyond the above description. Fortunately, the ECC software disciplines these restrictions for you. You simply click and drag the desired SIS message block from the top of the window to one of the available payload slots. Permitted placement choices are clearly indicated, and the application will not permit you to place a message in a restricted payload location.

Note that if a message requires more than two payloads to deliver its respective message, only a portion of the message gets broadcast each time the message is scheduled since each frame (16 blocks) are sent at a rate of one frame per 1.5 seconds.

NAME	PAYLOADS REQUIRED	DESCRIPTION
Station ID	1	Consists of FCC ID & Country Code
Station Location	1	Consists of Latitude, Longitude, and Altitude of station's location
Station Message	2 - 64	Up to 124 character text message (for broadcasters to use at their discretion)
Station Message	1	Bief description of each Service (MPS, SPS, Data) that is available
Call Sign Standard	1	4-character call sign
Slogan Standard	2 - 16	Station slogan (56-character text string)
Call Sign Universal *	2	Call sign (6 - 12 characters), supports extended characters
Slogan Universal *	2 - 32	Extended Slogan (95 - 124 character text string), supports extended characters
ALFN	1	Details of local time: Leap Second offset, time zone, daylight savings time, etc.
Parameter Message	1	Local Time data parameters, leap second, time offset

* Not supported in the current release

Station Information Settings Summary

Messages needing more than two payloads to complete will be repeated slower than the 1.5 second frame rate, unless they are scheduled to appear more than once per frame. For example if the Slogan Standard uses all 56 characters, it will need 16 payloads to complete. If it's scheduled four times per frame, it takes about six seconds for a full display on the HD Radio receiver's display:

```
16 / 4 (payloads/times per frame)
X 1.5 (seconds/frame) = 6 seconds
```

A similar situation applies to the latency of the Service Messages. Each service requires its own message. Only a single service's message is broadcast when a Service Message is scheduled. Therefore if a station wants to promote multiple HD services in a timely fashion, then Service Messages need to be scheduled more often.

As an example, assume a station has five Services total: three audio services (HD1, HD2 and HD3) plus two additional data services. If the station wants information about these services to be promoted with the least latency then the Service Information message must be scheduled five times in the 32 payload frame. If you've got five services, then five payloads will get it done in the 1.5 second frame period.

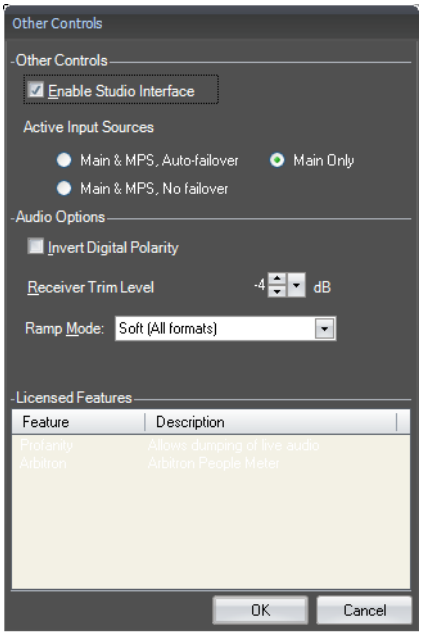
To summarize, here are some SIS guidelines:

- Message latency is managed though repetition
- Keep your messages as short as practical
- Allow shorter, more important messages, to be interspersed within the schedule of longer messages

The iBiquity default SIS schedule is included on the HDE-200 Flash Drive in the Documentation folder (Harris\APN-146-WCF HDE-200 SIS SETTINGS.pdf).

For further reading see the *The IBOC Handbook* by David Maxson (keep in mind that IBOC standards are a moving target, and that this handbook was out of date on the day it was published).

3.5.5.3 Other Controls



Other Controls Settings Window

Click *System > Other Controls ...* to open the Other Controls pop-up window which is divided into Other Controls, Audio Options, and Licensed Features.

Other Controls Section

Enable Studio Interface

Check mark *Enable Studio Interface* to activate the Remote I/O Logic connector on the rear panel of the HDE-200 (page 2-7 has details on using this connection). Uncheck *Enable Studio Interface* to disable this connection.

Active Input Sources

The default selection is *Main & MPS, Auto-Failover*. This setting is used when both the Main and MPS inputs have signals connected, as would be the case when the audio for the analog FM signal is separately processed from the MPS or HD Radio signal. In this mode, if either of the two AES input signals are lost, the other signal will be used to maintain signal continuity. This causes the Fault LED to light on the HDE-200 front panel.

Select *Main Only* when the Main AES input provides the signal for both the analog and the HD Radio modulation paths. The AES Fault indication is suppressed since the MPS input will not have a valid AES signal.

Select *Main & MPS, No failover* when the program processing is so different between the analog signal and the HD Radio signal that it is not desirable to use one signal in the other application. Thus, if either signal were to fail, there would only be an AES Fault indication without any internal signal switching to cover for the missing audio input.

Note that the HDE-200 does not perform silence detection, it simply monitors the two inputs looking for valid AES clock, outputting an AES Fault if no AES clock is detected.

Audio Options Section

Invert Digital Polarity

Check this selection to invert the signal polarity of the analog signal path within the HDE-200 in the unlikely event there is an unresolvable polarity inversion between the HD Radio signal processing and the analog signal processing paths through your system. Normally this is unchecked.

Receiver Trim Level

This control affects the HD Radio receiver's output level for the HD Radio signal. It's used to compensate for any apparent loudness disparity between the analog and HD Radio signals due to how the analog and digital signal chains are processed and transmitted.

The HD Radio signal's audio output can be adjusted by up to +/- 7 dB, as compared to the analog broadcast output level (which has a fixed level in the receiver). Adjust the output level in 1 dB increments by clicking the up or down arrows. Click the large arrow button to pop up a volume slider.

Ramp Mode

This setting affects how the HDE-200 Diversity and optional Profanity Delay ramping algorithms operate. There are three ramp modes on the HDE-200:

- Linear Ramp (not recommended)
- Soft Ramp (recommended for any format)
- Smart Ramp (recommended for sports and talk formats only)

Selecting **Linear** alters the Diversity and Profanity delays by a fixed rate. The default ramp rate is fairly slow, approximately 3% deviation from normal pitch and tempo. The downside of linear ramping is that most people can easily discern the beginning and end of the ramp change by the abrupt alteration of pitch and tempo.

If the ramp rate is too fast the effect is rather jarring to the audience. If the ramp rate is too slow, it will seem to take forever for the ramp process to complete. This method is the way all other manufacturer's exporter devices behave during Diversity delay alterations.

Soft Ramp (an HDE-200 exclusive mode) begins and ends the alterations of the Diversity and Profanity delays in a very gradual manner. The Soft ramp rate achieves an ultimate rate much faster than a linear rate without being noticeable to the listening audience. Soft ramp's default limit rate is a 6% deviation from normal pitch and tempo, which is roughly a musical semitone.

The advantage of soft ramp is that no one will discern the beginning and end change of pitch and tempo, while the ramp rate can be accelerated to a more rapid terminal ramp rate without listeners being able to discern the process. The Soft ramp selection can be applied to all program formats with no concern as to the audience impact.

Smart Ramp (an HDE-200 exclusive mode) alters the Diversity and Profanity delays in two ways: an extraordinarily slow, 0.8% ramp rate is used

while there is program material level above a certain threshold; a remarkably fast 20% ramp rate is then used when the program material level falls below this threshold. This has the effect of deviously shortening or lengthening gaps between spoken words. The advantage of Smart Ramp is that listeners cannot discern a change of pitch. At the same time, the duration that the ramp remains in process is dramatically reduced.

Of the three modes, Smart Ramp is the fastest, but since its ramp time is dependent upon the program material, the ramp duration is non-deterministic. One downside of Smart Ramp is that during extended musical passages, the ramping process is not particularly effective. Consequently, it's best to limit the Smart Ramp selection to spoken word format program material.

Licensed Features

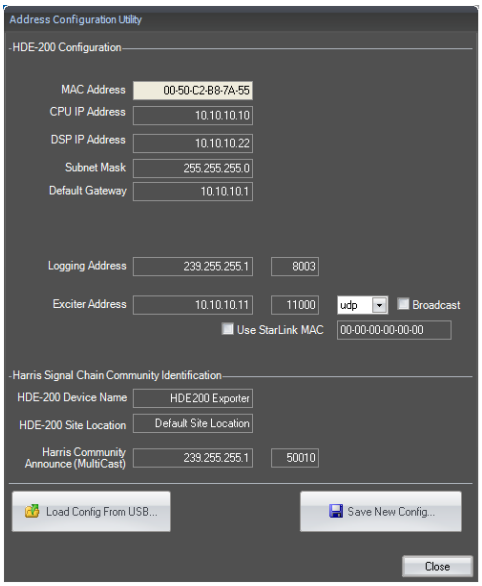
This section lists which licensed optional upgrade features have been enabled. Enabling the features is done by installing one of the iButton upgrades to the HDE-200. See Chapter 2 *Hardware Installation* for details on the Optional Upgrade Kits that are available.

3.5.5.4 Address Configuration Utility

Click *System > Address Configuration Utility...* to open the Address Configuration window. It has two sections: HDE-200 Configuration and Harris Signal Chain Community ID. Changing the settings in this window, for a new HDE-200, were covered on pages 3-6 to 3-8.

This window allows the active HDE-200's configurations to be edited and then uploaded directly to the HDE-200 by clicking *Save New Config...* which opens a pop-up warning (see page 3-8) that clicking *OK* will update and reboot the HDE-200. Click *Cancel* to stop the update procedure.

You can alternately use a USB flash drive to "sneaker net" the settings to the HDE-200. In this



Address Configuration Window

case click *Load Config From USB* to show the HDE-200 settings copied to the USB flash drive. A complete procedure for editing the HDE-200 Network settings in the ECC app, and for updating the HDE-200 using a USB flash drive was described earlier in this chapter.

NOTE: ECC will refuse to accept an IP address when the Gateway and IP addresses are not within the same subnet mask range. It also will not allow duplicate or all zero addresses.

The logging address is typically set within the range of 239.255.255.1 - .254 so the address falls within the normal address range for local network multicasting. The default setting is 239.255.255.1, using port 50010. It would be unusual to change these settings.

Harris Signal Chain Community ID

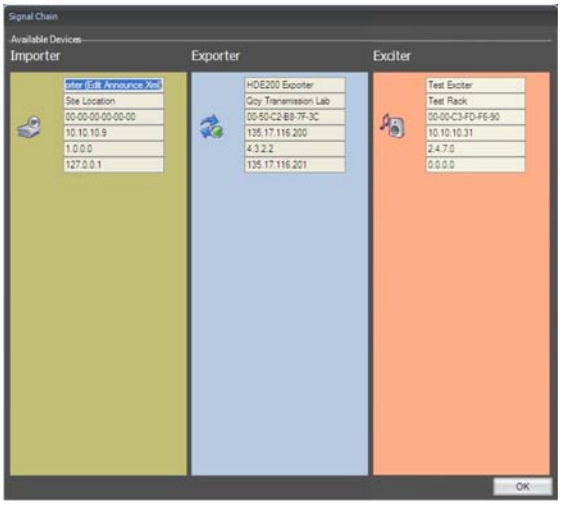
The dialog boxes in this section allow the user to enter a device name for the HDE-200 settings that are being shown in the top of the window, its location (e.g., TOC, rack 9), and its Multicast Com-

munity Announce IP address and port. Normally the Multicast address and port are left set to their default settings, but these may be edited for special purposes.

The HDE-200 sends status, meter data, and community announce messages to the network using Multicast Community Announcements so that the data can be displayed on any ECC app running on any computer in the network. Multiple Exporters will normally share the same Multicast address since the ECC app is designed to administer multiple HDE-200 devices.

3.5.5.5 Show Signal Chain

Click *System > Show Signal Chain...* to open the Signal Chain pop-up window, which is divided into three columns to show the various Importers, Exporters, and Exciters in the system.



Signal Chain Window

The Exgine in the FlexStar Exciter emits Multicast Community Announce messages like the HDE-200. Its information appears in the Exciter section.

The FlexStar Community Announce messages are provided as a convenience since they are not required for normal operation. In the future, they may play a larger and more critical integrative role.

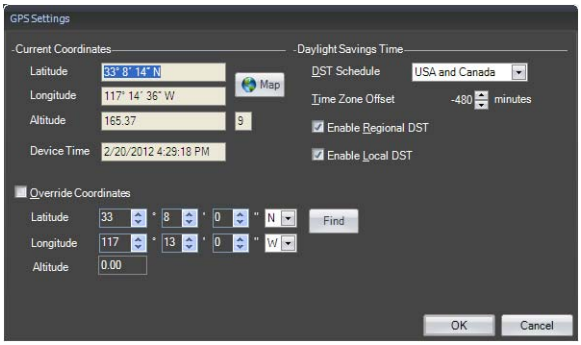
If you hover your mouse over the different elements of the available devices on the dialog box, a pop-up dialog box appears describing the item.

This Signal Chain dialog box is expected to become more evolved as other HD Radio synchrocasting implementations become available.

Multiple Importers, Exporters and Exciters may be visible in this dialog box, depending upon the extent of your community.

3.5.5.6 GPS Configuration

Click *System > GPS Configuration...* to open the GPS Settings pop-up window to show the HDE-200's GPS receiver performance.



GPS Settings Window

The **Current Coordinates** section lists the latitude, longitude, and altitude of the HDE-200 along with the number of satellites that the GPS receiver has detected. Clicking the Map button will display—provided the PC running ECC has Internet access, the location of the HDE-200 receiver.

Check **Override Coordinates** to enter your transmitter's coordinates in lieu of using the coordinates for the HDE-200's location.

The **Daylight Savings Time** section allows you to select the proper DST schedule for your location. A local time Zone Offset, set in minutes, is also available for locations that require this option. The settings for the standard North American time zones are shown on the next page:

North American Time Zone Settings

Newfoundland (-210)	Central (-360)
Atlantic (-240)	Mountain (-420)
Eastern (-300)	Pacific (-480)

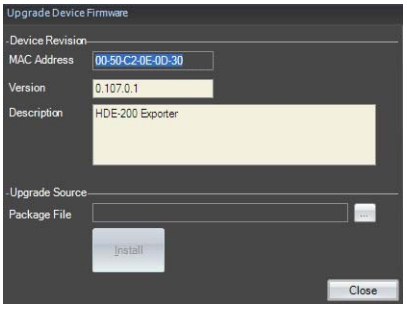
Enable Regional DST is checked for Regions or Nations that observe DST. This would always be checked in the United States.

Check *Enable Local DST* if your locality observes DST. This should *almost* always be checked as well. There are a few grey areas here: Arizona broadcasters typically leave this box unchecked since Arizona does not observe DST, whereas Indiana has worked out most of its DST mess: *http://en.wikipedia.org/wiki/Time_in_Indiana.*

You need not expend too much time on the time features, as the current iBiquity code release does not fully support all of this time data and there are no commercially available HD Radio receivers which make use of this time data anyway.

3.5.5.7 Upgrade Device

Click *System > Upgrade Device Firmware...* to open a pop-up window to show the currently connected HDE-200's MAC address, the current firmware code Version, and the HDE-200 description.



Upgrade Device Firmware Window

Use this information to ensure the correct HDE-200 is selected before proceeding with a firmware update.

HDE-200 firmware can be downloaded from the Harris Broadcast Customer Portal. See page 5-8 for access information.

Note that various firmware files will be found on the site under: *Download Software Updates > Radio Transmission > HD FM > HDE-200 Exporter.* Before downloading an update, talk with a Harris Field Service Engineer to determine the correct package for your application. There are also helpful App Notes about upgrading the firmware on this site as well.

The update process is comprehensive, updating the CPU, the DSP board, and the HDE-200 firmware in one procedure to avoid the complication of providing individual updates for the various software and firmware elements.

HDE-200 Firmware Upgrade Procedure

1. Download new firmware from the Harris Broadcast Customer Portal and save the zipped folder to the My Documents folder on the computer running the ECC app.
2. Insert a blank USB flash drive (32MB or larger) into the USB port located on the rear panel of the HDE-200. Wait one minute to allow the HDE-200 to save its current configuration files to the USB flash drive.
3. Select that HDE-200 so it is shown in the ECC app.
4. In the ECC app, select *System > Upgrade Device* to open the **Upgrade Device Firmware** window.
5. In the **Upgrade Source** section of the window, click the **...** button to browse to the zipped folder containing the firmware update.
6. Remove the USB flash drive from the HDE-200 and insert it into a USB port on the PC running the ECC app. Wait a moment to al-

low the USB flash drive to be recognized by Windows.

7. Click *Install*. In the pop-up window, select the USB flash drive as the destination. The ECC app will now unzip and copy the firmware code update files to the USB flash drive.

8. Once the updated files are copied from the PC to the USB flash drive, right click on "Safely Remove Hardware" in the Windows system tray and select the USB device (for example: "Safely remove USB Mass Storage Device"). Remove the USB flash drive from the PC's USB port.

9. Insert the USB flash drive back into the USB port on the rear panel of the HDE-200.

10. *The HD Radio signal encoding will be interrupted when you perform the next step*, so you must ramp out of the Diversity Delay and the optional Profanity Delay. You can do this using ECC or from the front panel buttons on the HDE-200.

11. Once the Diversity and Profanity Delays are both at 0.0 seconds (0% ramp), reset the HDE-200 by pressing the rear panel recessed button: **RESET PROCESSOR**. The HD Radio signal will be interrupted but the non-delayed analog audio continues through the HDE-200 during this process.

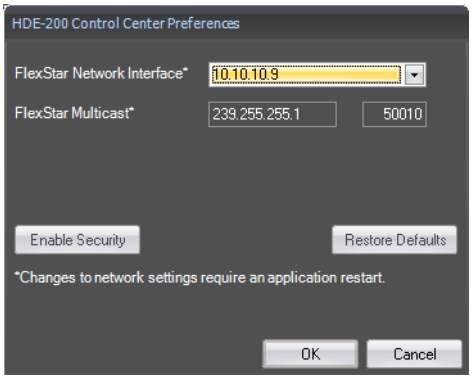
    It takes about four minutes for the HDE-200 to update the code (**ATTN: KEEP POWER ON** is displayed during the update process) and restart (a normal **STARTUP** message is displayed during this time).

12. When the normal display returns, Ramp Up the Diversity Delay and, if applicable, the Profanity Delay.

13. Remove the USB flash drive.

3.5.5.8 Preferences

Click *System > Preferences...* to open the *HDE-200 Control Center Preferences* pop-up window which shows which IP address the computer is using to communicate with the FlexStar LAN, the Multicast IP address, and Multicast port used to receive community Multicast messages.



Preferences Window

If there is only one network connection on the computer, then its IP address will be shown in the **FlexStar Network Interface** entry box. If there are two or more NICs in the computer, click on the down arrow to select the IP address for the NIC connected to the FlexStar network.

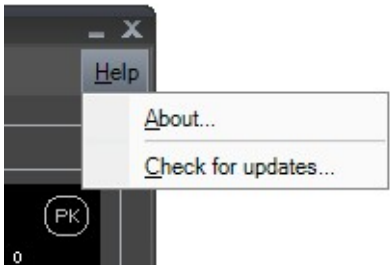
If this setting is not set to the NIC connected to the FlexStar devices then the ECC app will not see the HDE-200. Thus, this window is the first place to look if you cannot establish a connection to the HDE-200.

NOTE: To ensure proper Multicast monitoring by ECC, the **FlexStar Multicast** settings should be set to their defaults: 239.255.255.1, port 50010.

When the ECC app is first installed, the Windows Users and Groups security settings are NOT applied to the app, allowing for easy configuration of the ECC app and the HDE-200 Exporters. But, once the ECC app and the HDE-200s are configured, click **Enable Security** to activate the

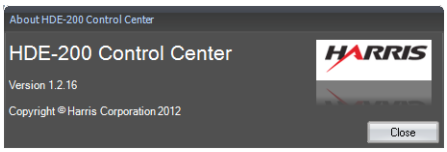
Windows Users and Groups to control access to the ECC app features. You must log into the ECC app, using your User Credentials as an Engineer or Commissioner, to then make any new changes on the HDE-200 configuration.

3.5.6 HELP



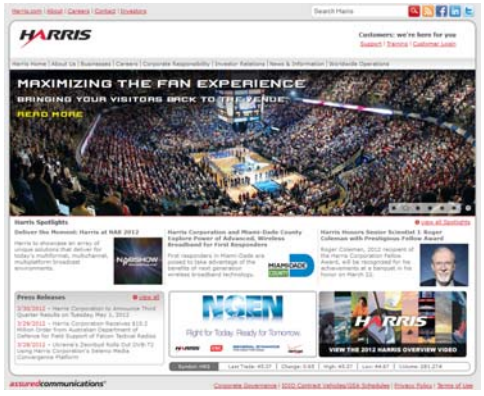
Help Menu

There are two options under help: **About** and **Check for Updates**. Selecting **About** lists the version of the ECC app.



About ECC Pop-Up Window

Selecting **Check for Updates** opens Internet Explorer on the Harris corporate web site (www.harris.com), which is only useful if the ECC app is on a PC connected to the Internet. Since, in most cases, the admin computer is not connected to the Internet, to check for updates, use a computer connected to the Internet and navigate to: **http://support.broadcast.harris.com/**



Check for Updates Opens the Harris Webpage

Using the Harris Customer Portal requires registration. If you already are registered, enter your username and password. A new user must select **New User** in the *Customer Login* window and complete the registration process.

Once you have access to the Harris Customer Portal, under *Self Service* click *Download Software Updates > Radio Transmission > HD FM > HDE-200 Exporter* to locate the files pertaining to the HDE-200 and ECC app.

3.6 Supplemental Software

Several software utilities, app notes, and other files are provided on the HDE-200 USB flash drive. Copy these to the admin computer for reference. These files can also be downloaded from the Harris Customer Portal website as well:

Software supplied by Harris

· HDE-200 Logger Utility

Software supplied by iBiquity Digital

· PSDGen 4.7 package (executable binaries)

3.6.1 HDE-200 LOGGER UTILITY

This utility receives log messages from the ECC app and from the HDE-200 devices. The logger collects these messages, filters them, and then forwards important ones to the Windows Event database. The utility should be run on the FlexStar network admin computer at startup. It typically resides as an icon in the system tray.

3.6.1.1 Installation

Locate and open the *LogInstall.msi* file on the HDE-200 Flash Drive. Select Install for Everyone during the installation.

Using the HDE-200

4

The HDE-200 has limited front panel controls, which are for engineering use only. Board operators and other users interface with the HDE-200 through using the Exporter Control Center (ECC app), a software application running on Windows™ XP, Vista, or Windows 7 Pro computers networked with one or more HDE-200 Exporters, or through a hardware button control panel.

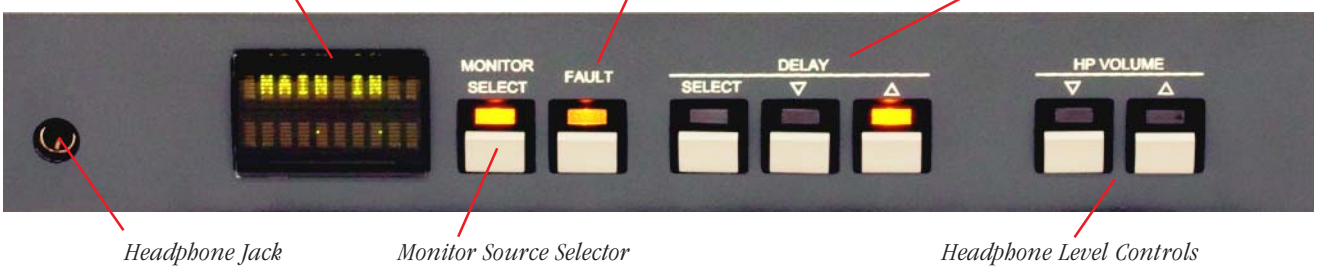
4.1 HDE-200 Controls

The front panel controls on the HDE-200, shown below, allow engineers to monitor various audio inputs and outputs both visually, through a front panel level display, and aurally, through a front panel headphone jack or the rear panel AES monitor output. Only three buttons—Monitor Select, Headphone Volume up and Headphone Volume Down, are needed to quickly select, view, and listen to any input or output.

A dual row dot matrix display shows the name of the Monitor Source Signal in its top row while the stereo signal level is shown in the lower row. This display can alternately show alarm conditions; delay status for the Diversity and optional Profanity Delay; and the headphone output level.

4.1.1 SELECTING THE MONITOR SOURCE

Press the *Monitor Select* button to sequentially step through the four monitor sources: **Main In** is the analog transmission's input signal; **MPS In** is the digital transmission's input signal; **Main Out** is the analog transmission's output signal from the HDE-200; and **MPS Out** is the internal-only audio signal feeding the iBiquity DSP board. Note that **MPS In** will not be available if the HDE-200 is set to use a common input (Main In) as the source for both the analog and digital transmission chain signals. In addition, the output of the iBiquity DSP board cannot be monitored by the HDE-200 since it is the E2X serial data stream



** Alternately shows Alarm Conditions, Diversity or Profanity Delay Ramp Status, Headphone Volume level*

HDE-200 Front Panel
Front Panel Controls and Displays

going to the three Ethernet ports, thus monitoring of this signal can only be done at the HD Radio Exciter.

4.1.2 HEADPHONE VOLUME ADJUST

Pressing the *HP Volume Down* or *Up* (▽△) buttons, lights both LEDs and changes the display to show **Volume** in the top row and the current headphone level in the bottom row.

Tap the *Down* button to decrease the volume in 2 dB steps. The length of the bargraph is also decreased. Conversely, tap the *Up* button to raise the headphone volume in 2 dB steps, which also increases the bargraph length.

The maximum volume (0 dB) is indicated by a full bargraph. The minimum volume (-50 dB) is indicated by no bargraph. Note that dots in the bargraph indicate 0%, 50%, and 100% of the volume range.

4.1.3 DELAY STATUS & CONTROL

Press *Delay Select* to show the status of the Diversity Delay or Profanity Delay. If the optional Profanity Delay iButton is not installed, only the Diversity Delay status is shown.

The display's upper row identifies which delay is shown: DVRSTY DLY (for the Diversity Delay) or PRFNTY DLY (for the Profanity Delay). The bottom row bargraph indicates the delay status—from fully ramped down (empty bargraph) to fully ramped up (full bargraph).

The *Down* and *Up* (▽△) LEDs above the delay Down and Up buttons indicate the displayed delay's status. When the *Up* LED is lit solid the displayed delay is at maximum. When the *Down* LED is lit solid, the displayed delay is at minimum (0.00 seconds).

An Up or Down LED blinks to indicate ramp up or ramp down. The display also shows an up arrow (^) or a down arrow (v) at the right end of the delay bargraph to indicate which way the delay is ramping: an up arrow indicates the delay is building or getting longer and a down arrow indicates the delay is ramping out or getting shorter.

Pressing the *Down* or *Up* (▽△) button that has a lit LED has no action, whereas pressing the button with the unlit LED reverses the ramp direction.

When the display shows monitor signal levels, a fault condition, or the headphone volume, the Ramp Down and Up button LEDs indicate the current status for both the Diversity and the Profanity delay. In normal use, both delays are typically full, thus the Ramp Up LED is normally lit. But, both LEDs might be lit, or one or both LEDs might be blinking, because the two delays are in different states. Press *Delay Select* to view the status for the Diversity Delay. If the optional Profanity Delay is active, pressing *Delay Select* again will show the Profanity Delay.

4.1.4 FAULT

The *Fault* LED is unlit if there are no fault conditions in the HDE-200. Pressing the *Fault* button in this state shows **Alarm** in the top row and **System OK** in the bottom row.

The *Fault* LED blinks to indicates a fault condition in the HDE-200. Press the *Fault* button to change the display to show the fault. **Alarm** appears in the top row while the bottom row lists the alarm condition. If there are multiple faults, press the *Fault* button again to show the next alarm.

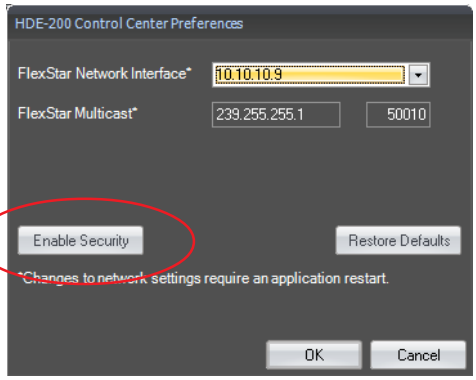
A logic output is triggered when a fault is detected. This can be used to alert engineering. See page 2-7 for more information on the Studio Remote panel connections and Critical Fault Tally output.

Once the fault is cleared, the *Fault* LED turns off, the Alarm display returns to show System OK, and the Critical Fault Tally is turned off.

4.2 Using the ECC App

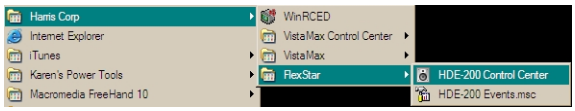
Any user can monitor any HDE-200 through the Exporter Control Center software (ECC app) running on a studio computer. Any HDE-200 Exporter in the network can be monitored, or monitored and controlled, depending upon the credentials of the logged in user. User credentials are set using the facility's normal system login names. When the user is assigned to an HDE-200 User Group, as defined by a computer administrator when the ECC app was installed, then they will have their assigned level of access. If the user logged into the computer is not set as an HDE-200 User, and they start the ECC app they will have No Credentials access.

NOTE: When the ECC app is installed, security is NOT ACTIVE and any user is a Commissioner. Once the ECC app, the HDE-200s, and the User Groups have been configured, it is important to click the **Enable Security** button on the HDE-200 *Preferences* window to activate User accounts. Until this is done any ECC app user has full access to change any setting on any HDE-200!



ECC App Preferences Pop-Up Window with the Enable Security Button

To start the ECC app, double-click its icon on the desktop. A program shortcut is also added to the Windows *Programs* menu. Click *Start* > *Programs* > *Harris Corp* > *FlexStar* > *HDE-200 Control Center*.



ECC App Location in the Start Menu

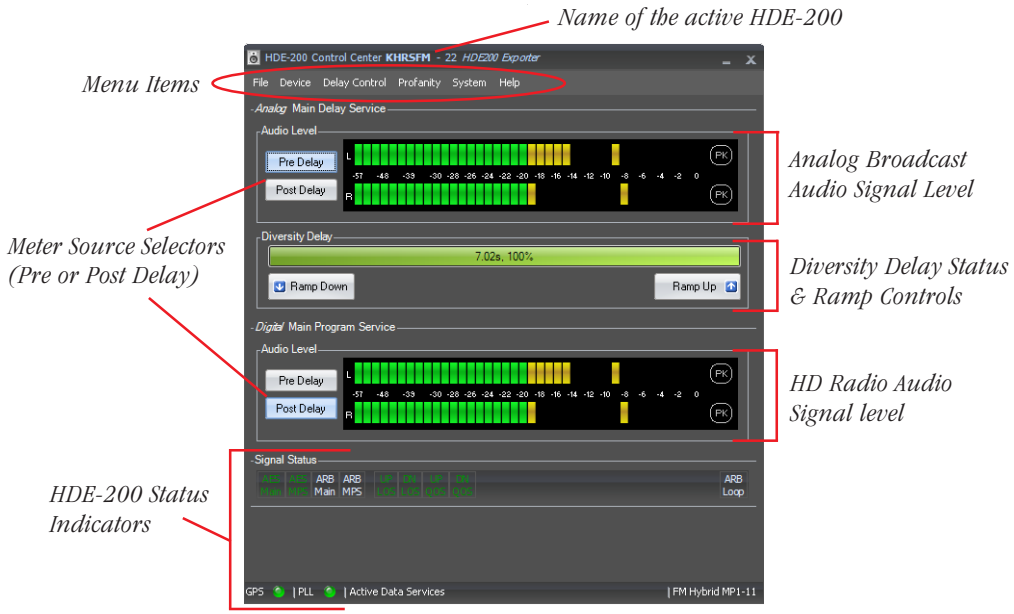
The main program window, shown on the next page, opens up showing the name of the active HDE-200 at the top of the window, above the menu items. When first opened **(No Device)** will be shown until an HDE-200 is selected.

To select an HDE-200, click *Device* > *Select Device* to open the **Exporter Device Browser** window. It lists all of the Harris HDE-200s detected on the local network. Double-click on a device name to select that HDE-200, or click to highlight the name, then click *OK*, or press *Enter*, to select that HDE-200 and close the window.

ECC App, Device Browser Window

The selected HDE-200's current status and configuration information is sent to that ECC app. If audio is going through the HDE-200, the audio meters will immediately show the audio levels for the Analog and Digital Main Programs.

If no HDE-200s are shown, then the ECC app Preferences may not be set up properly. See page 3-21 about the *System* > *Preferences...* menu item.



ECC App, Main Window

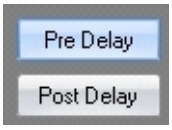
4.2.1 AUDIO METERING

One of the main ECC app uses is to allow the audio levels for both the analog carrier and the HD Radio signal to be shown in the HDE-200.

The top meter (Analog Main Delay Service) shows the audio levels for the Main Delay Input (Pre Delay) or the Diversity delayed signal (Post Delay). This audio signal's ultimate destination is the analog exciter/transmitter.

The bottom meter (Digital Main Program Service) displays the audio levels for the MPS Audio Input (Pre Delay) or the audio going to the iBiquity DSP board (Post Delay). There is no meter display of the iBiquity DSP output since it's an Ethernet data stream feeding the HD Radio exciter/transmitter.

4.2.1.1 Meter Source Selection



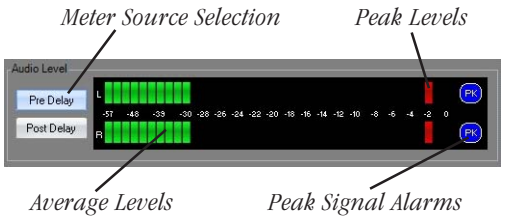
The source for each meter is independently selected by the two buttons to the left of the meters. The blue highlighted button is the active source. Pre Delay selects the audio input and Post Delay selects the output audio for each meter. Click the gray button to change the meter source.

The top, or **Analog Signal** meter, can show the Pre Delay audio level (the audio as it enters the HDE-200 on the *Main Delay In*put jack) or the Post Delay audio (the audio level as it exits the HDE-200 on the *Main Delay Out* jack). The Post Delay signal may have no delay, a Diversity delay, a Profanity delay or both Diversity and Profanity delays, depending upon the current settings of the HDE-200.

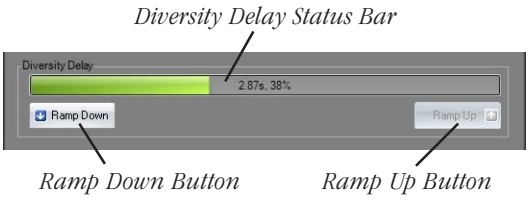
The bottom, or **Digital Signal** meter, when set for Pre Delay, shows the AES digital audio signal as it enters the HDE-200 on the *MPS Audio In*put. If the HDE-200's Active Input Source is set for Main Input only, then this meter shows the same signal as the upper meter. Post Delay shows the audio level feeding the iBiquity HD Radio DSP processor. This signal will only be delayed if the optional Profanity delay is active, otherwise the Pre and Post Delay metering is identical in time.

4.2.1.2 Audio Levels

Each meter displays both the average signal level (shown as a bar) and a peak level indication (shown as a moving single segment typically six - ten dB above the top of the average level, depend-



ECC App Meter Features



Diversity Status and Ramp Controls

ing upon the amount of signal processing). Peak levels are held for one second before decaying.

Ideally, the right end of the average level bar will fall between -20 and -12 dBFS marks for typical processed air signals. The levels from -57 dBFS up to -20 dBFS are displayed using green segments. Signal levels from -19 dBFS up to -3 dBFS are shown using amber segments. This is the area where the average and peak indications should normally be seen. The amber color indicates you are getting close to using up the signal headroom.

The last three segments: -2, -1 and 0 dBFS, use red segments to indicate these levels are dangerously close to digital clipping. An occasional peak in this area is OK, but regular peaks in this area indicate the level is too hot and digital clipping may occur.

To the right side of each meter are two Signal Peak indicators. These blue indicators turn on any time a signal level of -3 dBFS or higher is detected. If the blue Peak indicators regularly turn on, the signal level feeding the HDE-200 is too hot.

4.2.2 DIVERSITY DELAY CONTROL

Status indication and control of the Diversity Delay are located just below the *Analog* meter.

There are two controls in this section (Ramp Up and Ramp Down) to allow a User to control the Diversity Delay, which is a delay that delays the analog broadcast so it is aligned with the HD Radio broadcast.

The Diversity Delay Status Bar shows both a visual and the numerical state of the diversity delay. When the delay is out (or ramped down), then the diversity delay is 0% with 0.00 seconds delay. When the delay is fully ramped up, then 100% and the diversity delay setting, in seconds, is shown.

The Progress Bar waxes green from left to right in a linear fashion as the delay is built from zero seconds to the target value. The relative length of the bar corresponds to the percentage completion of the delay.

If there is currently no Diversity Delay, the Ramp Up button is enabled. Holding the pointer over the Ramp Up button (mouse over) turns it Yellow signifying that clicking will cause the action to occur.

Once the Ramp Up button is clicked, the Exporter commences inaudibly increasing delay, typically utilizing the **Soft Ramp** feature, to the *Analog* audio stream. It continues this process until the Diversity Delay target is reached or the Ramp Down button is clicked.

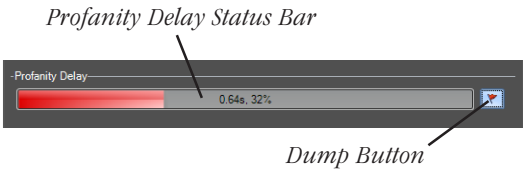
The green Progress Bar appears immediately progressing from left to right as the delay increases. Also, the amount of delay in seconds and the percentage completion begin to increment. While the Diversity Delay is ramping up, the Ramp Up Button function is "grayed out" and not available for activation.

Ramp Down may be initiated at any time the delay is ramping up or when the delay has reached the "Target Value." During ramp down, the progress bar proceeds from right to left. Also, the amount of delay in seconds and the percentage completion decrement. While "ramping down" the Ramp Down button is "grayed out" and not available for activation.

4.2.3 PROFANITY DELAY CONTROL

When the optional Profanity Delay is active on the HDE-200 being displayed there is a second delay status box for the Profanity Delay below the Digital Program meter levels. It does not have Ramp Up and Down buttons, but one Dump button (with a Red Flag) at the end of the status bar.

The Profanity Delay Status Bar shows the state of delay by a visual, numerical, and percent of the delay. When the delay is out (or ramped down), then the profanity delay is 0% with 0.00 seconds delay. When the delay is fully ramped up, then the bar is green, the profanity delay setting in seconds and 100% is shown.



Profanity Status and Dump Button

The Profanity Progress Bar waxes red from left to right as the delay builds from zero seconds to the Total Profanity Duration. The relative length of the bar corresponds to the percentage completion of the delay. The bar color turns from red to green as the delay builds past the Dump Duration setting (set in the *Profanity Delay Settings* window), which means that a dump event could occur at that point.

Triggering a dump event can be done using the on-screen or a hardware remote panel Dump button to allow a producer or call screener to dump the Profanity Delay. The Profanity delay almost instantly ramps down the delay by the Dump Duration. Most often the Dump Duration is set to only dump part of the delay so that a second dump event could be triggered as the dump builds back up. For example, if one Dump dumps 50% of the delay, then a second Dump would dump the rest of the delay.

When the Profanity Delay is dumped, the delay instantly starts to rebuild the delay using the assigned ramp method so it is almost inaudible to the listeners. The Progress Bar will be red if the dump is below the Dump Duration time, turning green once a delay event can be triggered again.

4.2.4 STATUS INDICATORS

The bottom portion of the ECC app's main window shows the status for the signals required for proper operation of the HDE-200.

ECC App, Status Indicators

The Signal Status names and indicators use various colors to indicate their current status. A name in white indicates an option or signal that is not active. A name or indicator in green means that the signal is present or good. A name or indicator in red or orange indicates a fault condition.

In some cases these faults will also be indicated on the front panel of the HDE-200, blinking the Fault LED.

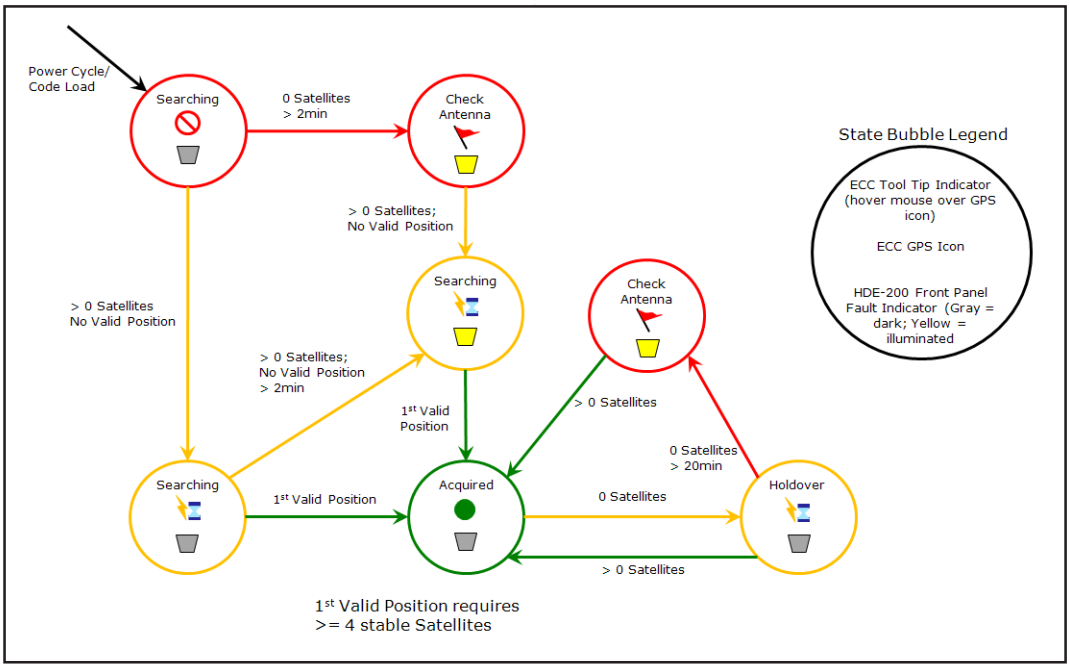
Here's a summary of what the various Signal Status names and indicators mean:

AES Main = Main Delay Input status: green (has AES clock); red (no AES clock detected)

AES MPS = MPS Audio Input status: green (has AES clock); red (no AES clock detected)

ARB Loop = Arbitron PPM Encoder option status: white (PPM option not active); green (iButton installed with PPM option)

ARB Main = Arbitron PPM Encoder audio for the analog broadcast signal: white (PPM option not active); green (has AES clock); red (no AES clock detected)



GPS Lock Status Indications

ARB MPS = Arbitron PPM Encoder audio for the HD Radio signal: white (PPM option not active); green (has AES clock); red (no AES clock detected)

UP LOS = status of service to HD Exciter

DN LOS = status of service from HD Importer

UP QOS = Quality of Service to HD Exciter

DN QOS = Quality of Service from HD Importer

GPS = status of the GPS receiver (hovering over this indicator will pop up various messages, as shown in the illustration above, to indicate the GPS status in more detail)

PLL = 1 PPS clock status

Active Data Service = type of active service

Encoding Format = the active encoding format (e.g., FM Hybrid MP1-11 for HD Radio using FM transmission)

Service

The HDE-200 is designed to yield many years of trouble-free 24/7 operation. But, if it does require service, read through this chapter as it provides technical information on the HDE-200 along with a list of parts and repair services available through the Harris service department in Quincy, Illinois, USA.

5.1 Parts and Repair Services

The field-replaceable parts available for the HDE-200 are listed on page 5-2. Most parts are field-replaceable rather than being readily field-serviceable. Printed Wiring Assemblies (PWAs) should be returned to Harris for repair as individual circuit board components are not available from the Harris service department.

There may be additional HDE-200 technical information, beyond what is included here, available from the Harris Broadcast Customer Portal website: (`http://www.broadcast.harris.com.servicesandsupport/`).

Most documents, including schematics and wiring diagrams, are published in PDF format, which requires Acrobat Reader 6.0 or later to view. The current Acrobat Reader software can be downloaded, at no charge, from the Adobe website (`http://www.adobe.com`).

5.1.1 PARTS ORDERING AND REPAIR INFORMATION

Replacement PWAs and other parts can be obtained through the Harris parts department in Quincy, Illinois, USA. To ensure the correct part is ordered, be sure to use the Harris product number when ordering. A list of HDE-200 part and product numbers is on page 5-2. Some parts may not have a product number assigned yet, see the note in the parts list for details. Also, some parts may have long lead times, so order accordingly.

Products returned to Harris for service, exchange, or credit must have a Return Authorization (RA) tracking number assigned by the Field Service Department prior to their return. Items received without an RA number clearly written on the shipping label side of the packaging may be delayed and subject to additional handling fees.

To request an RA number, the Harris Field Service Department can be contacted via telephone, fax, e-mail, the web, or regular mail:

Harris Corp
BCD Field Service Department
PO Box 4290
Quincy, IL 62305-4290 USA

Service Phone: 217.222.8200
Service Fax: 217.221.7096
Service E-mail: tsupport@harris.com
Web: www.broadcast.harris.com

Return shipping charges are added to all non-warranty repairs. Serviced parts are normally shipped, within the USA, using FedEx or UPS economy service. Overnight and next morning delivery are also available for most items.

International customers must specify their preferred return shipping method when requesting an RA number.

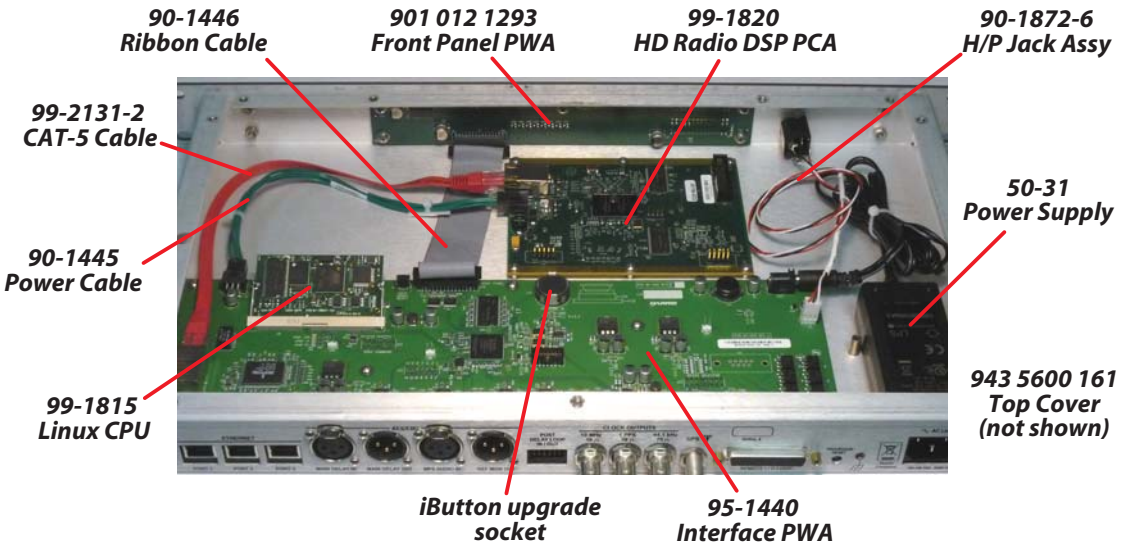
5.1.2 HDE-200 REPLACEMENT PARTS

Harris #	Description
50-31	5 VDC Power Supply
76-1440	HDE-200 Connector Kit
15-999	Hood, D-Sub
15-967	44-pin D-Sub Connector
90-1445	Cable, Interface Controller to HD Radio DSP
90-1446	Cable, Interface Controller to Front Panel
90-1872-6	Assy, H/P Jack and cable
PRE17-22	TRS jack
90-2131-2	Cable, CAT-5, flat
95-1440	Interface Controller PWA
99-1815	Linux CPU
99-1820	HD Radio DSP PCA
99-1811	GPS Antenna, Trimble Bullet III

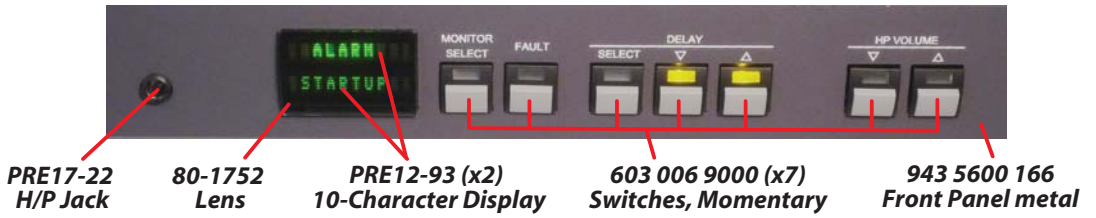
Harris #	Description
901 012 1293	Front Panel PWA
PRE12-93	10-Character Display
80-1752	Lens, Dual Display
603 006 9000	Switch, Momentary
943 5600 166	Front Panel (silkscreened metal only)
943 5600 161	Top Cover

NOTE: Not all parts have been assigned a "product number" as of the date of this manual revision. These parts will require a product number (assigned by the Harris parts department) before they can be sold as a replacement part.

HDE-200 Chassis Parts



HDE-200 Front Panel Parts



HDE-200 Replaceable Parts

5.1.3 UPGRADE KIT PARTS

Profanity Delay (HARHDE200-PROFAN)

Harris #	*Description or Use*	*Qty.*
21-801-1	iButton for Profanity Delay	1
71-1441	Installation documentation	1

Arbitron PPM Interface (HARHDE200-PPM)

Harris #	*Description or Use*	*Qty.*
21-801-2	iButton for Arbitron PPM	1
71-1441	Installation documentation	1
90-2200	Interface Cable Assy	1

Arbitron PPM & Profanity Delay (HARHDE200-PROF/PPM)

Harris #	*Description or Use*	*Qty.*
21-801-3	iButton (PPM & Profanity Delay)	1
71-1441	Installation documentation	1
90-2200	Interface Cable Assy	1

5.2 Technical Overview

The HDE-200 consists of four PCAs:

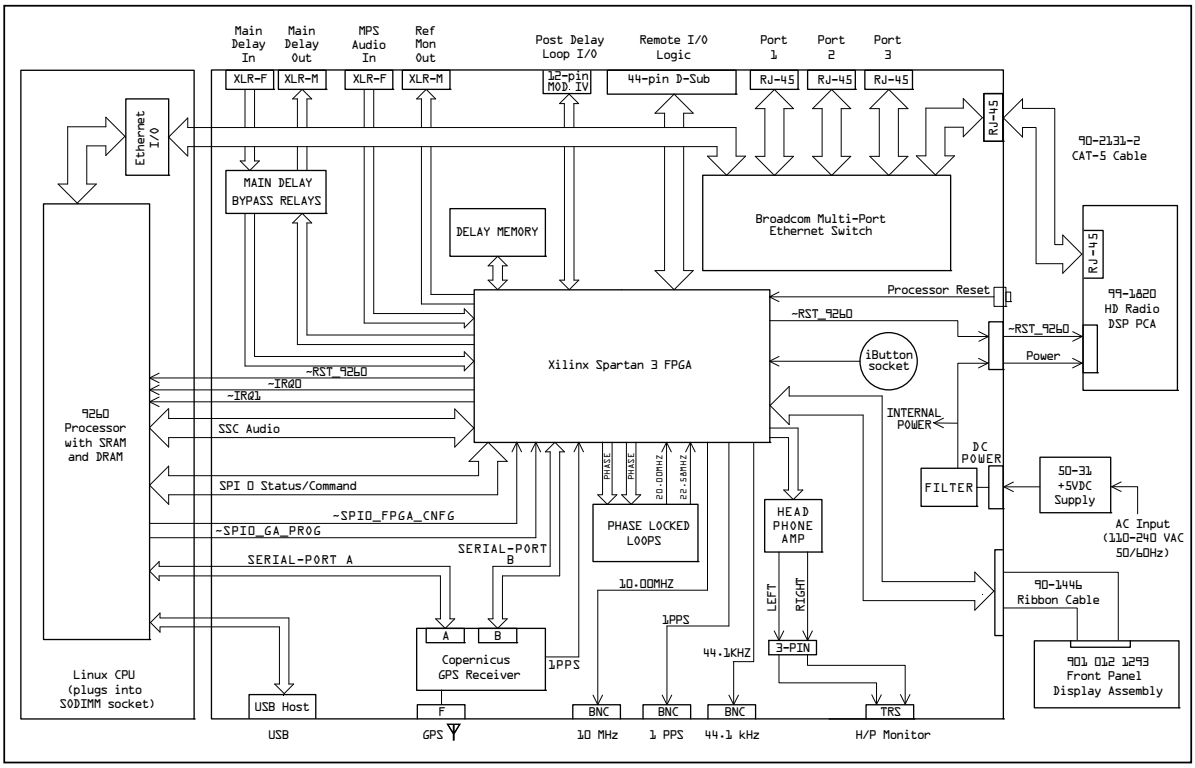
- **Interface Controller**
- **Linux CPU**
- **Front Panel Display**
- **HD Radio DSP**

The HDE-200 block diagram is shown below. The part identifiers in this section are silkscreened onto the circuit boards.

The power supply—a commodity +5 VDC "line lump" type held captive within the chassis, plugs into J23 on the Interface Controller. The 5 volt output is filtered, regulated and/or current limited by U14, U15, U17, U32, U38, U39, U40, and U41 to derive the four supply voltages (+1.2, +1.8, +3.3 and +5 volts) used in the HDE-200.

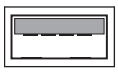
5.2.1 Interface Controller

A Field Programmable Gate Array (FPGA), U33, controls signal routing, remote I-O logic, the



HDE-200 Block Diagram

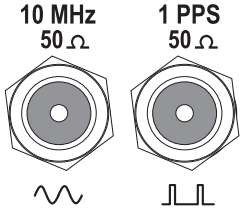
front panel displays, and for the delay processing. It's programmed by the data stored in a 2 MB Flash Memory chip (U16). The board's firmware code can be updated, as required, by plugging a USB thumb drive with updated data files into the USB port (J6) on the rear panel. The update procedure is detailed in a Code Update section, later in this chapter.



A 128 MB SDRAM chip (U26) is used for the Diversity Delay and for the optional Profanity Delay. About 47 seconds of total delay time is available.

A GPS antenna signal (input on J20) feeds a Copernicus GPS receiver (U1). The center conductor of the type-F connector carries a current limited +5 volts to power the GPS antenna. The GPS receiver has 1 PPS (pulse per second) clock and GPS lock outputs. If the GPS receiver is not locked onto the GPS satellites, the FPGA then generates a GPS Unlock alarm.

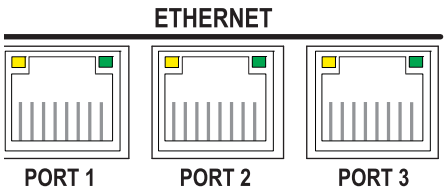
Two VCXOs (made up of Y2, Y3, and U25) generate a 20 MHz and a 22.5792 MHz clock which are phase locked to the GPS 1 PPS signal. The 20 MHz clock is divided in half to generate the 10 MHz clock output, which is further divided by 3,125 to generate a 3,200 Hz clock, which is compared with the 1 PPS signal in a phase detector circuit. Another 3,200 Hz clock is generated by dividing down the 22.5792 MHz clock. This clock is phase locked to the 3,200 Hz clock generated by the 20 MHz VCXO.



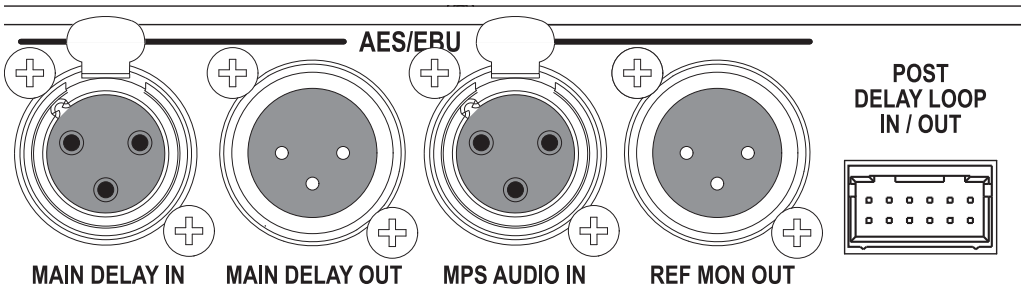
The 10 MHz clock output (on J11) is used to synchronize an HD Radio Exciter, when it's co-located with the HDE-200, along with the 1 PPS clock output, which is sent through a tri-state octal buffer (U10) to J9. These signals are typically only used when the HD Radio Exciter is co-located with the HDE-200.

The 22.5792 MHz clock is divided by two to generate a 11.2896 MHz master clock for the FPGA, the delay memory, and the AES transmitters. This clock is called the 256fs clock since it is 256 times the 44.1 kHz AES audio sample rate, which is called the fs clock. The 11.2896 MHz clock is also divided by 4 to create a 64fs clock, which is used by the AES receiver chips. It is divided by 256 to generate the 44.1 kHz master clock which is sent through a line driver (U10) to rear panel jack, J10.

An Ethernet switch chip (U24) connects the Linux CPU (plugged into SODIMM socket J8) to the HD Radio DSP board (via the internal CAT-5 cable) and to the three rear panel RJ45 jacks (Port 1, Port 2, Port 3). These ports can be used to directly connect to an HD Radio Importer, admin computer, STL, HD Radio Exciter, or to a facility network switch.



The iButton socket (J35) connects to the FPGA. An iButton is a 1-wire® device programmed with a specific code to unlock optional features on the HDE-200. The iButton uses +3.3 volts and must be installed for the optional features to function.



All audio inputs and outputs conform to AES/EBU standards for digital signals. Each input and output goes through a 110 ohm balanced AES signal transformer (T2 - T9). The Main Delay In (J2) signal goes through a relay (U28) which couples the signal, through relay U29, to the Main Delay Out (J4) whenever the HDE-200 is unpowered.

Each digital input, after being unbalanced by the AES transformer, goes to an AES receiver chip (U35 - U37) which time aligns and sample rate converts the incoming AES or S/PDIF signal to the internal 44.1 kHz sample rate that the HDE-200 uses. The serial data output of each AES receiver goes to the FPGA for internal routing. An AES Loss alarm is generated if an AES signal is not present.

The four digital outputs (Main Delay Out, Ref Mon Out, and the two loop outputs) go through AES transmitter chips (U18 - U21) that connect through AES transformers (T4, T5, T8, T9) to J4 (Main Delay Out), J5 (Ref Mon Out), and J1 (the Post Delay Loop outputs).

The front panel headphone jack is driven from

U22, a combined DAC (digital to analog converter) and headphone amp in one chip. The Front Panel HP Volume buttons adjust the output level in twenty-five 2 dB steps. The maximum output level is 50 mW per channel into 16 Ohm headphones.

Refer to the *Hardware* chapter for a detailed description of the 44-pin Remote I-O Logic connection.

5.2.2 FRONT PANEL DISPLAY

The Front Panel Display board connects to the Interface Controller using a 30-conductor ribbon cable that carries +5 volts and various control signals to and from the display. The Interface Controller's FPGA drives the Front Panel components through two Octal Line Driver/Buffer ICs (U11 and U12).

The Front Panel Display board has few active components. Its two 10-Character Intelligent Displays (DS1 and DS2), mounted in IC sockets, indicate Alarm status or show a selected input or output signal level. The displays are self-supporting with built-in signal decoding and multiplexing circuits and LED drivers. Each display character is a 5x5 dot matrix with individually addressable LED segments. Two reference dots (visible between the audio signal level bargraphs) indicate 0 dBFS (full scale digital) and -20 dBFS (20 dB below full scale digital).

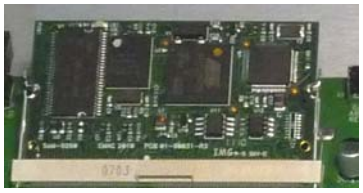
The seven Front Panel switches connect in an X-Y matrix to the FPGA chip on the Interface Controller. The amber LEDs (D1 - D7) indicate

operational status or an error condition. These are driven by U1, a 16-bit shift register/ latch with constant current LED driver outputs.

5.2.3 LINUX CPU

The Linux CPU is the small PCA latched into a SODIMM memory card socket (J8), a 144-pin edge connector on the Interface Controller.

The CPU is an Atmel ARM9 microprocessor running a Linux kernel (a subset of a full Linux install) so it takes about 30 seconds for it to boot up from pressing *Processor Reset* or from when power is first applied to the HDE-200.



The CPU includes on-board SDRAM to hold the Linux operating system and the HD Radio codec code. It has an Ethernet interface (hence the Linux CPU MAC address and IP address) that goes through T1 on the Interface Controller to connect to the Broadcom Ethernet switch.

The CPU also has a USB controller (Host 2.0 compatible). USB power is supplied by U41 on the Interface Controller.

5.2.4 HD RADIO DSP

The Main Program Service (MPS) audio, plus the various HD Radio data and settings assigned using the Exporter Control Center (ECC app), program service data (PSD) from a digital playback system, and any incoming data received from an HD Radio Importer, is encoded by the HD Radio DSP board using an Ethernet connection on the Interface Controller. Thus, the HD Radio DSP board also has its own separate MAC and IP addresses. In addition, each board is serialized, to identify the exact codec that generated the HD Radio signal. This serial number must be properly identified during HDE-200 configuration.

The HD Radio DSP board is based on a Texas Instruments TMS320C6713 floating point DSP. This DSP chip is used to compress and transform the incoming MPS audio into the HD Radio format using proprietary code (HDC codec) supplied by iBiquity. The ECC app selections and the HD Radio Importer data and secondary audio channels are combined with the processed MPS audio to then create the HD Radio E2X data stream, which is output on the Ethernet ports to feed the HD Radio Exciter.

5.3 HDE-200 Troubleshooting

As with other software-based products, if the HDE-200 should stop responding to the front panel controls or to the ECC app, then it most likely indicates the unit has to be reset. If there is no HD Radio audio output, then it would indicate the Linux CPU, which controls audio routing through the HDE-200, or the HD Radio DSP board have hung up and will need to be reset.

The analog broadcast audio will continue since there are fail-over relays that couple the Main Delay In audio to the Main Delay Out audio in the event of a CPU failure. If there is an issue with the Interface Controller FPGA, then the Diversity Delay will be affected.

If any of these conditions are encountered (no HD Radio signal but the Main Delay Out is still working) then the first step would be to press the **Processor Reset** button on the rear panel. This reboots the Linux CPU, reloads the FPGA configuration from the Flash Memory, and restarts the HD Radio DSP.

It takes about 30 seconds for the Linux CPU to complete rebooting (a boot message is shown on the front panel display during this time). At the

end of this boot time the Linux CPU reestablishes communications with the HD Radio DSP and with the HD Radio Exciter. The HD Radio DSP board can then begin processing the incoming audio, which will take roughly seven to fifteen seconds to make it through the processor and out the Ethernet connection to the HD Radio Exciter.

During this time the analog broadcast audio continues, but in a non-delayed state. The Blend control bit is turned off until the Diversity Delay completes rebuilding to its set length. Once the Diversity Delay is ramped back to full, the Blend function is turned back on since the analog broadcast is now time locked to the HD Radio audio.

5.3.1 HDE-200 DEVICES DO NOT SHOW UP IN THE ECC APP

When no HDE-200 devices appear in the HDE-200 Exporter Control Center list of devices to connect to—even though one or more HDE-200 devices are responding to pings from the computer, then there are typically three possible causes:

- The FlexStar Network Interface (*System Preferences*) address has a typo, the wrong NIC was assigned, or the FlexStar network cable is plugged into the wrong NIC.
- The FlexStar Multicast settings differ from the default setting of 239.255.255.1, port 50010 in the ECC app or on the HDE-200 device. For most installations the default settings should be used.
- The Windows Firewall is enabled and is not configured to allow HDE-200 messages or ECC app communications through the firewall.

Any one (or more) of these configuration errors will cause the multicast messages, transmitted by the HDE-200 devices, to not be received by the ECC app. Subsequently, this means that the HDE-200 devices will not appear in the select device list.

Check that the NIC address for the computer's interface to the FlexStar network is set correctly and verify the FlexStar Multicast settings are correct. If both were set correctly then the issue is most likely associated with the Windows Firewall settings.

Windows Firewall is automatically disabled inside the Harris domain network. However, when a user logs into Windows but does not use the Harris domain, the default setting for the Windows Firewall (for WinXP SP2 and later) is automatically enabled. This enabled setting will block multicast messages sent by the HDE-200 from being received by the ECC app.

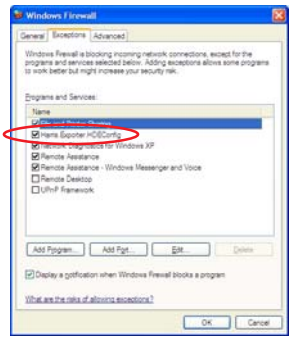
5.3.2 CONFIGURING THE FIREWALL TO UNBLOCK THE ECC APP

A security alert pop-up window, shown below, appears if the ECC app is started and Windows Firewall is blocking the HDE-200 multicast messages. Click *Unblock* so Windows Firewall will allow these communications to reach the ECC app. The HDE-200 should now appear on the select device list.

If the Windows Firewall was incorrectly configured (e.g., someone previously clicked *Keep Blocking*) or the pop-up window does not appear, then the Windows Firewall configuration will have to be manually changed. Open Windows Firewall (*Start/Settings/Control Panel/Windows Firewall*) and select the **Exceptions** tab.

Windows Security Alert
To help protect your computer, Windows Firewall has blocked some features of this program.
Do you want to keep blocking this program?
Name: Harris.Exporter.HDEConfig
Publisher: Harris Corporation
Keep Blocking
Unblock
Ask Me Later
Windows Firewall has blocked this program from accepting connections from the Internet or a network. If you recognize the program or trust the publisher, you can unblock it. When should I unblock a program?

Windows Security Alert Pop-up



Windows Firewall Exceptions List

The program name ***Harris.Exporter.HDEConfig*** will be listed. In order for multicast messages to get through the firewall, the program name must be checked, as shown in the illustration. Once checked, click *OK* to save the changes and close Windows Firewall. The HDE-200 should not appear in the ECC app Device list.

5.4 Embedded Software & Firmware Updates

The proprietary iBiquity HD Radio codec embedded software, the TINI card's Linux operating system and the Interface Controller card's FPGA firmware may be updated over the life of the HDE-200. When updated code is available, it can be downloaded from the Harris Broadcast Customer Portal website:

`http://www.broadcast.harris.com.servicesandsupport/`

To access this site, you must be a registered user. The Radio and TV/Software Downloads section of the Harris support site is where the HDE-200 code can be found.

To determine whether newer code is available, the current code running on each HDE-200 in your network can be shown using the ECC app. Select the *Device* menu item, then choose *Select Device*. Each HDE-200 Exporter connected to the network will be listed. The **Version** column shows the code version running on each HDE-200.

HDE-200 code is distributed in a compressed (.zip) folder. The code and version is listed in the folder name (e.g., HDE-200_code_1.90.5.zip). The code is downloaded from the Harris site to a computer running the ECC app.

You must be logged into this computer as a Commissioner in order to access the *System* menu items in the ECC app. A USB Flash Drive (32MB or larger) is required to transfer new code to the HDE-200.

NOTE: Changing the HDE-200 code **will interrupt** your HD Radio signal. To prevent interruption of your analog broadcast signal, ramp out of Diversity Delay before changing code. Once the code update is complete, ramp the Diversity Delay back in to return to normal operation.

The analog audio continues through the HDE-200 during the code upgrade, however, there may be momentary dropouts as the HDE-200 restarts using the new code. During the code updating procedure—which requires a Processor Reset and will take roughly three minutes, the HD Radio digital signal will be off-air. This forces HD Radio receivers to switch back to the analog signal.

5.4.1 HDE-200 CODE UPDATING

1. Insert a writable flash drive (32 MB or larger) into the USB port on the back of the HDE-200. **Wait for one minute**, or until the drive activity LED stops blinking, to allow the HDE-200 to detect the drive and to upload its current configuration settings to the drive in a folder labeled with that HDE-200's MAC address. The flash drive can then be unplugged.

2. Insert the flash drive into the computer with the **.zip** folder holding the updated code.
3. Start the ECC app. In the *Device* menu choose *Select Device* and select the HDE-200 that you want to upgrade. This connects the computer to that HDE-200.
4. In the *System* menu, select *Upgrade Device* to open the *Upgrade Device Firmware* window. This window shows the MAC address, the current code version and the description of the selected HDE-200. Verify this is the correct HDE-200.
5. In the Upgrade Source section of the window, click the browse button (...) then locate the **.zip** folder with the new code. Double-click the folder, or click *Open*, to set that folder as the Package File Upgrade Source.
6. With the **.zip** folder shown in the *Package File* field, click *Install*. This opens the *Select Drive* window. Select the USB flash drive, then click *OK*. The ECC app automatically extracts and copies the code files to the flash drive, saving the files to an Update folder in the HDE-200's MAC address folder (e.g., HDE200\00-00-00-00-00-00\Update).
7. Close the *Upgrade Device Firmware* window. If needed, click on *Safely Remove Hardware* in the Windows system tray and select the USB device (e.g., Safely Remove USB Mass Storage Device), then unplug the drive.
8. Insert the flash drive into the USB port on the HDE-200 rear panel.
9. Ramp down the Diversity Delay by clicking *Ramp Down* in ECC or by pressing the front panel button on the HDE-200.
10. Once the Diversity Delay ramps to 0.0 seconds, restart the HDE-200 by pressing the recessed *PROCESSOR RESET* button on the HDE-200 rear panel. This will automatically upload the new code. The HDE-200 front panel shows ATTN: KEEP POWER ON while the code is uploaded into the various HDE-200 components. Once this is done, the HDE-200 will restart and the front panel will display STARTUP until the HDE-200 startup process has completed. During this time the HD Radio data stream will be silent and the analog signal will be bypassed.
11. Once the HDE-200 has finished restarting and STARTUP is no longer shown on the front panel, and the HD Radio signal data stream is active once again, then ramp the analog signal Diversity Delay back in.

5.4.2 UPDATING THE ECC PROGRAM

The HDE-200 Exporter Control Center software (ECC app) can only be removed or updated by an administrator on the computer running the ECC app. Also, if user groups have been set up, then the current ECC user must be a member of the *HDE-200 Commissioner* group.

1. If running, close the ECC app.
2. Open up *Add or Remove Programs*. (Windows Start/Settings/Control Panel).
3. Highlight *Harris FlexStar HDE-200 Control Center* from the list of currently installed programs, then click *Remove* and *Yes* to remove the program.
4. Once the ECC app is removed, close the *Add or Remove Programs* window.
5. Locate the installer file for the updated version of HDE-200 Control Center. The current version can be downloaded from the Harris Customer portal. See page 5-8 for site access details.
6. Launch the installation file by double clicking the **.msi** file.

7. Click *Next* to open the *Select Installation Folder* window. For best results, use the default file location. Before continuing, set the program access. Select *Everyone* so that multiple users can log into the computer and use ECC. Continue the installation by clicking *Next* on this and the following screen. Once the installation completes, click *Close* to close the installer window.
8. The ECC program automatically leaves the four Windows user groups as they were from the previous version of the program. If new users need to be added or others removed, follow the instructions on page 3-3 to set user access to the ECC program's features.

NOTE: The ECC program requires Microsoft .NET Framework Version 2.0 Service pack 1. It can be downloaded from Microsoft's website (http://www. microsoft.com).

5.5 Replacing Assemblies

Should the DSP assembly (PRE99-1820) or CPU assembly (PRE99-1815) require replacement, they must be "paired-up" before use.

NOTE: Unplug the HDE-200 from the Ethernet network, before applying power, if either the CPU or DSP assemblies have been replaced.

When power is first applied to the HDE-200, the CPU performs a scan of the local IP network subnet looking for the presence of the DSP assembly. Once the DSP assembly is found, the IP address for that DSP board is automatically updated to the DSP IP address that had been previously recorded by the CPU. Two scenarios can occur, depending upon which assembly was replaced.

Scenario 1: The CPU is replaced.

The existing DSP IP address is returned to the factory default (10.10.10.22).

Scenario 2: The DSP assembly is replaced.

The new DSP assembly will be changed to the IP address that was assigned to the replaced DSP assembly.

Note that the pairing process will take a bit longer than the typical startup duration (could last up to 5 minutes). This is normal for this pairing process. The HDE-200 will automatically restart again after the DSP assembly has been found and paired with the CPU.

If the HDE-200 continually restarts, this is an indication that the CPU is not able to pair up with the DSP. This could be due to the CPU detecting another HDE-200 on its local network. If this occurs, the CPU will purposely refuse to perform the pairing process. In this case, disconnect all network cables from the HDE-200.

If a USB Flash Drive is connected—before starting the Boot process, a boot log file will be written to the Flash Drive. This will give a progress indication for the pairing process. Contact Harris Technical Support if continuous restarting occurs even with the network cables disconnected.

Once the pairing is complete, review the IP address assignments using HDE-200 Control Center. Make any IP address adjustments that may be necessary. Once all the network settings match their previous settings, the connection to the Ethernet network can be restored.

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Application Note AN10-02

FlexStar HDE-200

Exporter Control Center and Windows 7

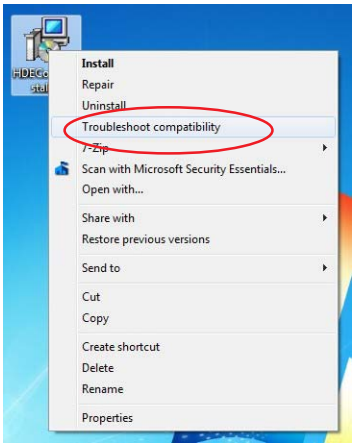
OVERVIEW

The Exporter Control Center (ECC app) is supplied by Harris to configure and monitor HDE-200 Exporters. It can be run on computers using WinXP (SP2), Vista Pro, or Win7 Pro. Because Windows 7 offers much tighter control over security and firewalls, and in public vs. private network settings, many users have experienced difficulty in installing and using the ECC app on a Windows 7 computer.

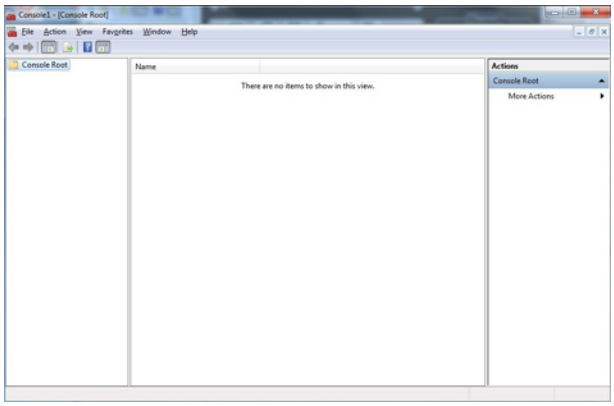
USING ECC ON A WINDOWS 7 COMPUTER

Here are some tips on installing and configuring the ECC app to run on a Windows 7 computer.

1. If security messages (this is not a Windows certified program, etc.) are displayed when running the *HDEConfigInstaller.msi* program, then close out of the install. Right-click on the file name and select **Troubleshoot Compatibility** to open the Program Compatibility window, which analyzes the program for compatibility with Windows 7. Once it finishes, click **Start The Program** to install the ECC app. It should now install without any pop-up warning boxes, although you will still get permission pop-ups, depending upon the Windows 7 security settings.

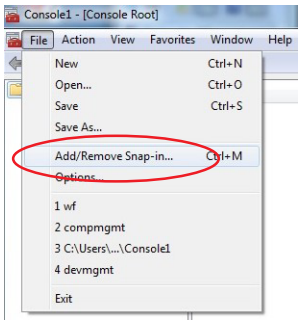


2. Once the program is installed, make sure that the computer's network adapter, which connects to the HDE-200 network, is configured as a **private network**. Often you can't change an unidentified network to private because that function is prevented by a default security setting. Thus, you have to change the security setting first so that the network is not made public in the first place. This can be done in the Microsoft Management Console (MMC) window.



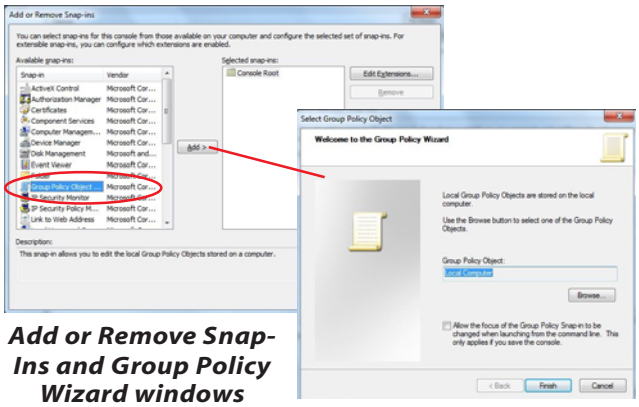
Microsoft Management Console window

To open this window, click the START button and then type MMC into the search dialog box. The MMC program will open (again, you may get a permission pop-up, if so, click OK).



Click on **File** and select **Add/Remove Snap-in** to open up the Add or Remove Snap- in window (shown on the next page).

Click on the Group Policy Object Editor to highlight it, then press the Add button to pop up the Group Policy Wizard. *Local Computer* should be displayed by default. If so, click **Finish** to accept Local Computer and close the



Add or Remove Snap-Ins and Group Policy Wizard windows

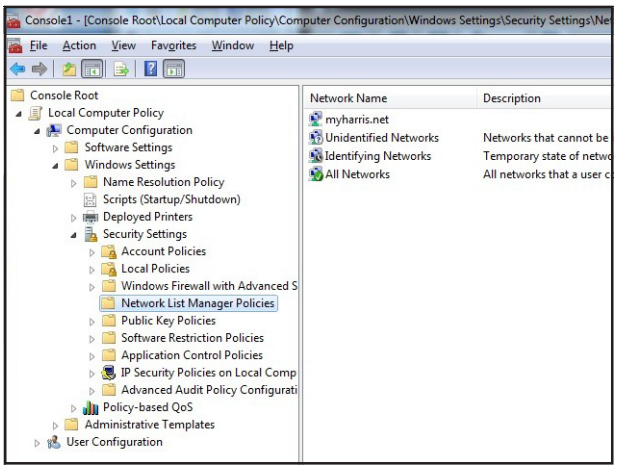
window. Then click **OK** to close the Add or Remove window.

In the MMC window's left hand pane, there is a new entry: *Local Computer Policy*. Click the small arrow next to the name to expand the display to show *Computer Configuration*.

Click the arrow next to Computer Configuration to show *Windows Settings*.

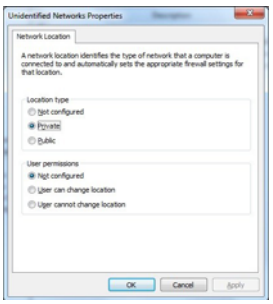
Click the arrow next to Windows Settings to show *Security Settings*.

Under Security Settings, click *Network List Manager Policies*, to highlight it. This then shows, in the right hand pane, the networks used by that computer.



Selecting Network List Manager Policies in the MMC window

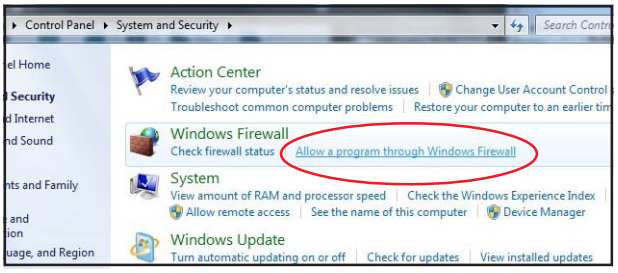
Double-click on *Unidentified Networks* to open up the Unidentified Network Properties window. Set the Unidentified Networks as **Private** then click **OK** to close the window.



3. Verify the Windows Firewall, if on, allows the ECC app to communicate with networked HDE-200 Exporters.

You can view the Windows Firewall Permissions through the Windows Control Panel: click **Start**, then **Control Panel**, then click **System and Security**.

In the window that opens, click **Allow a program through Windows Firewall**. This opens a window listing installed programs and their permissions.



Verify that Harris.Exporter.HDEconfig is check marked for both Public and Private network access. If each is checked, then click **Cancel** and close the various Control Panel windows.

If either box is unchecked, then click **Change Settings**, to activate the window, then click each box so ECC can access both Public and Private networks. Click **OK** to save the settings and then close each open Control panel window.